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HINTS AND OBSERVATIONS
ON
MILITARY HYGIENE;
WITH
THE BEST MEANS
OF
TREATING THE MEDICAL AND SURGICAL DISEASES OF THE ARMY.

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HINTS AND OBSERVATIONS

ON

MILITARY HYGIENE.

INTRODUCTION.

Believing it to be the duty of every one to do all in his power to aid the Government in the present crisis, I have collected from the best sources within my reach such facts and observations as have been found useful both in this country and in Europe, regarding the sanitary management of troops in and out of camp, so as to keep the soldiers in good health, and by the most efficient means to relieve disease, both medical and surgical. By publishing it in a public journal, and distributing it freely, I trust I will be contributing my mite to the general good.

The great importance of sanitary regulations are shown by the following facts:

In the first seven months of the Crimean campaign, the mortality among the troops was at the rate of 60 per cent. per annum from disease alone—a rate of mortality which exceeded that of the great plague among the population of London. The number of sick and wounded soldiers received into the hospitals at Scutari was about 41,000, and the number of British soldiers who died in those hospitals during the residence of Miss Nightingale, was 4,300. The causes were: exposure, bad food, deficient clothing, fatigue, damp, bad drainage, bad ventilation, overcrowding, nuisances, organic effluvia, malaria. The diseases were: diarrhoea, dysentery, rheumatism, frost-bite, scurvy, typhus, typhoid, and remittent fevers, and cholera. Typhus fever attacked both sick and well in the hospital. During the month of November, 1854, alone, there were 80 recorded cases of hospital gangrene. Out of 44 secondary amputations of the lower extremities, 36 died. The mortality of hospitals can be compared in two ways, which mutually check and confirm each other. *First*, by dividing the deaths by the mean "strength" of the sick in the hospital,

and reducing the mortality to that which would obtain, if the time of observation were a year. *Second*, by dividing the number of *deaths* by the number of *cases treated*.

What the commander of the forces and the war department want and ought to know about the health of an army is: 1. How long the army will last at the then rate of mortality. 2. Whether the diseases are preventable from which the mortality arises. 3. What proportion of the army is inefficient from sickness. A health officer should be attached to the Quartermaster's department, and have full power to attend: 1. To the draining of sites; 2. To sewerage; 3. To the cleansing of outskirts; 4. To the ventilation; 5. To the water supply; 6. To the lime-washing and cleanliness of the buildings; 7. To the allotment of cubic space; 8. To the sanitary conduct of burials. The personal hygiene of the patients must be left to the medical officers.

Before and after the works executed by the sanitary commissioners begun in 1855, the hospitals at Scutari bore a similar sanitary relation to that of the gaols of the last century, which were pest-houses, compared with Colonel Sibb's prisons in 1857, the most healthy buildings in existence. Such a sanitary commissioner will be, I trust, appointed by the Secretary of War of the United States.

CHAPTER I.

CAUSES OF DISEASES OF THE ARMY.

The most frequent causes of diseases in armies are the sensible changes in the air, either from heat to cold, or from dryness to moisture.

Soldiers in camp, according to Dr. Rush, suffer much from heat, by being constantly exposed to the sun, either without any shade at all, or only covered by a thin tent; and

where the air is so much confined that the heat is often more insupportable than without, in the sun. This circumstance, joined with the damps so incident to camp life, seems to explain why the summer and autumnal diseases of an army, even in a northern latitude, resemble so much the epidemics of southern countries, especially of those with a moist air.

It has been found that great heat alone is insufficient to cause much sickness without the accompanying condition of moisture, as the neighborhood of marshes.

Cold is much oftener the immediate cause of disease in the army, either alone or, especially, when attended with moisture.

Moisture.—Soldiers are much exposed to dampness in their tents, where the air can never be thoroughly dry, in consequence of the constant exhalation going on, to which is often added the moisture caused by rains, even where the site of the camp is dry or properly drained. Where there is deep water, the locality is not so dangerous to troops as marshy grounds, or meadows that have been once flooded, and but lately drained; there are situations, too, which, though dry in appearance, may yet be moist by reason of the transpiration of subterraneous water; such grounds are apt to produce bilious fever. Stagnant, moist air in low and woody countries is apt to produce fevers, especially when the men have to lie upon the wet ground.

Of the General Means of Preventing Disease in the Army.—To prevent disease arising from heat and cold, to avoid the effects of intense heat, commanders should direct that the marches should be early in the morning, or after the intense heat of the day is over. Soldiers suffer less from sleeping in the open air (when the ground is dry) than in tents.

The preservatives from cold consist in clothing, bedding, and fuel. Under-shirts and woolen over-shirts, with or without vests, over-coats, strong shoes, with blankets for each tent, and cloaks for the cavalry should be provided. There should always be sufficient fuel to dress their food, and correct the dampness of their barracks, though the troops should trust rather to warm clothing and exercise than to fire for preventing diseases arising from cold.

To Prevent Diseases arising from Moisture.—Let the quartermasters examine very carefully every barrack and refuse house, with cellars con-

taining water, or which have been uninhabited. Attention should also be paid to their being aired and well ventilated.

In the field, the best security is by making trenches around the tents, by which means the natural moisture of the ground is lessened, and the rain-water is intercepted and carried off without wetting the straw. The soldiers should be allowed plenty of straw, and have it frequently renewed, or, when it cannot be obtained every few days, it should be taken out and well aired. Without this precaution, it will not only grow damp, but soon rot and prove unwholesome. The tents should be thoroughly ventilated daily; if not, it will cause everything to become moist and unhealthy. Oil-cloths spread upon the ground of the tent, and kept dry, intercept much of the rising vapor. Mattresses should not be laid upon the ground.

Soldiers unavoidably exposed to rain on marches and out-duty should be allowed to make a fire with wood in the rear of the camp. Where the grounds are dry, camps are most healthful on the banks of large rivers, because, in the hot season, those situations have the advantage of fresh air from the water to carry off both the moist and putrid exhalations.

To Prevent Diseases arising from Impure Air.—With regard to the impure air of marshes and other stagnating water, if it is necessary to continue long upon such ground, the best expedient will be to make frequent removes, for, by shifting, the straw will be changed, the men will have more exercise, and the impure animal matter will be left behind, which, in camps, is particularly noxious. As to the cantonments in marshy ground, if the troops must remain there in the dangerous season, it will be better to float the fields entirely than to leave them half dry.

Dr. Rush remarks that the certainty of its good effects is evinced by those low countries in the United States, which are sickly in ordinary seasons, being uncommonly healthy in those seasons in which the low or marshy grounds are covered by an unusual quantity of rain.

In order to preserve purity of air in dysenteric seasons, let there be some slight penalty for neglecting to use the privies, and from the middle of July, or upon appearance of a spreading dysentery, let the privies be made deeper than usual, and once a day a thick layer of earth with lime thrown into them. It may also be pro-

per to order the pits to be made either in the front or rear, as the reigning wind of the season may best carry off their effluvia from the camp. When the dysentery begins to be frequent, the sick should not be sent to one common hospital, at least not in such numbers as may vitiate the air.

Barns and granaries make good summer hospitals. Dr. Rush testifies, from experience, to the advantages of barns for military summer hospitals, in preference to any other buildings. Churches, in common with barns, owe their advantages for military hospitals to the height of their ceilings. The latter are cooler than churches, from having no windows in them, and currents of air are conveyed through them more directly and more easily to the bunks of the sick. Another point to be observed in a fixed camp is to have the regimental hospitals scattered, and not crowded into one village. It may be proper to make the following distinction :

In the first part of a campaign, when inflammatory distempers prevail, those who are taken ill are to be left behind, as such cases least admit of motion, and at the same time are not infectious. But those who fall ill from the end of summer to the decline of autumn, will bear motion, and generally mend upon a change of air, are rather to be carried with their regiments and dispersed, than collected into one place to breed and propagate the infection. Dr. Rush considers that these remarks should be qualified. It is true, he observes, that soldiers ill with the hospital-fever are generally benefited by being gently removed in wagons in warm weather, but great mortality uniformly followed the removal of such patients in cool or cold weather, in the same vehicles, in the Revolutionary war of the United States.

As to the disposition of hospitals, with regard to preserving the purity of the air, the best rule is to admit so few patients into each ward, that any one unacquainted with the danger of bad air might imagine there was room to take in double or triple the number.

This Dr. Rush considers an excellent rule, which should be carefully attended to by physicians who have charge of military hospitals. The neglect of it deprived the United States of several thousand soldiers during the Revolutionary war.

In winter hospitals, chimneys (with open fire-places) only should be used, and stoves never ; for though the latter may warm a large

ward better and at less expense, yet by scarcely making any draught of air they will be apt to promote its corruption, whereas a fire in a chimney acts like a constant ventilator. Dr. Rush remarks that a strict regard ought to be had to this direction. Dr. Tilton combined warmth and ventilation very happily in the log military hospitals constructed by him in Morris county, New Jersey, by making the fires in a hollow in the centre of the hospitals, and leaving an opening in the roof in a perpendicular direction to them, through which the smoke was discharged. The bunks surrounded the fire-place. After kindling the fire the patient suffered no inconvenience from the smoke. Their short and transient sufferings from this cause were overbalanced by its salutary effects, for it has been proved by Dr. Clark in his treatise upon the diseases incident to long sea-voyages, that smoke checks the propagation of fever from morbid exhalations.

To Prevent Diseases arising from Improper Diet.—

No order will be able to restrain soldiers from eating and drinking what they like, if they have money to purchase it. Therefore a fundamental rule, and, indeed, almost all that is necessary, is to oblige the men to eat in messes, by which means we may be assured the best part of their pay will be bestowed on wholesome food.

This method being established, it only remains to take care that the men be supplied with good bread and fresh vegetables during the hot weather.

Vinegar with molasses, or a small portion of claret, or even New England rum, is one of the useful drinks during the heat of summer, mixed with water. Fresh mutton and beef are useful articles broiled, but fresh pork is injurious, while good salted pork or ham was found by Dr. Rush to be a preservative of the health of the Revolutionary army of the United States.

The chief rule in diet in sickly times is to eat moderately, avoiding surfeits and indigestion.

To Prevent Diseases arising from Errors in Exercise.—

The greatest fatigue which a soldier undergoes is in making long marches, especially in hot or rainy weather. When the service requires it such hardships must be endured, but they will be attended with less sickness if care be taken to supply good provisions and plenty of dry straw. At other times when dispatch is not necessary, short marches, before the heat

of the day, with proper halts, are so far from harrassing the troops, that nothing can be more conducive to the preservation of their health. In fixed camps, as there is always more sickness from inactivity than from fatigue, it would not be amiss to make proper regulations about the exercise at such times, as our soldiers, left to themselves, are naturally too indolent to use what is fit for them. The exercise of a soldier may be considered under three heads: the first relates to his duty; the second to his living more commodiously, and the third to his diversions.

The first, consisting chiefly in the exercise of his arms, will be no less the means of preserving his health than of making him expert in his duty; and frequent returns of this, early and before the sun grows hot, will be more advantageous than repeating it seldom and continuing it too long, for a camp affording little convenience for refreshment, all unnecessary fatigue is to be avoided.

As to the second article, cutting boughs for shading their tents, making trenches around them for carrying off the water, airing the straw, cleaning their clothes and accoutrements, and assisting in the business of the mess, are all things which, as they must be strictly executed by orders, ought to be no disagreeable exercise to the men for some part of the day.

Lastly, as to diversions, since nothing of that sort can be enforced by order, the men must be encouraged to them, either by the example of their officers or by small premiums, but caution is necessary with regard to excess, especially in hot weather, for nothing is more prejudicial to the soldier, when heated with work (or amusement) than to strip, expose himself to the cool air, and greedily drink cold water, and especially well-water, which commonly is very cold; river water is less hurtful, as the rays of the sun, to which it is constantly exposed, prevent its being so cold.

Neatness cannot be too much insisted on. Let the soldiers frequently wash their hands, their faces, and their feet, and if the season permit, let them bathe as much as possible in running water.

The Seasons Compared with Regard to the Health of an Army.—In the beginning of every campaign we are to expect, for the first month at least, that the returns will be considerably

higher than if the men had remained in quarters.

After the first fortnight or three weeks of the encampment, the sickness daily decreases, as the most infirm are already in the hospital, the rest more hardened as the weather is growing daily warmer.

This healthy state continues throughout the summer, (that is until the middle of August,) unless, by some extraordinary exposure to rain, the men get wet clothes or lie wet, in which case, in proportion to the preceding heat, the dysentery will be more or less frequent until October, with more or less intermittent and remittent fevers, which continue until the frosts begin.

Winter expeditions, though severe in appearance, are attended with little sickness, if the men have good clothing, shoes, quarters, fuel, and provisions.

Dr. Rush states that the American Revolutionary war furnished a memorable instance of the truth of this remark. Among nearly two thousand Philadelphia militia troops, whom General Cadwalader commanded on the Delaware in the winter of 1776 and '77, and to whom Dr. Rush acted as Physician-General, there was but one death, and not more than half a dozen sick in the course of six weeks, notwithstanding the greatest part of them slept in tents, or in the open air before fires, or upon barn or kitchen floors, during the whole of that time.

The same careful observer says:

"The army, when in tents, was always more sickly than in the open air. It was likewise more healthy when it was kept in motion than when it lay in an encampment. Young men, under twenty years of age, were subject to the greatest number of camp diseases. The Southern troops were more sickly than the Northern or Eastern troops.

"The native Americans were more sickly than the natives of Europe who served in the American army. Men above thirty-and-five and thirty years of age were the hardiest soldiers in the army. Perhaps the reason why the natives of Europe were more healthy than the native Americans was, they were more advanced in life.

"The Southern troops sickened from the want of salt provisions; their strength and spirits were restored only by means of salted meat."

Dr. Rush states that he once saw a private in a Virginia regiment throw away his ration of choice, fresh beef, and give a dollar for a pound of salted bacon.

"Those officers who wore flannel shirts or waistcoats next to their skins, in general escaped fevers and diseases of all kinds."

"The principle diseases in the hospitals were the typhus, gravior, and mitior, (or typhoid.) Men who came into the hospitals with pleurisies or rheumatisms soon lost the types of their original diseases, and suffered or died by the above-mentioned states of fever."

No doubt produced by the want of proper air, light, space, ventilation, and warming.

"The typhus mitior (or typhoid) always prevailed most and with the worst symptoms in winter. A free air, which could only be obtained in summer, always prevented or mitigated it."

This can be obtained at all seasons if only your hospital is constructed in a proper manner, as I will show in this paper when we come to the subject of the sanitary condition and hospital construction.

"In all those cases where the *contagion* was received, cold seldom failed to render it active. Whenever a hospital was removed in winter, one-half of the patients generally sickened on the way or soon after their arrival at the place to which they were sent."

There are, we believe, at the present day, but two or three diseases which have a specific virus and can be propagated by inoculation: but even these are not contagious in the sense employed here by Dr. Rush; the word which should have been here used is "infection," which simply expresses a fact, and does not involve an hypothesis. Infection acts through the air. The air of Dr. Rush's hospital was poisoned, and, as soon as the sick were brought into it, they were affected by it, and these sick people were more susceptible than healthy if they were exposed to cold without sufficient covering they must die, or, if they were shut up without sufficient space and sufficient fresh air, there will be produced not only fever but erysipelas, pyemia, and hospital gangrene.

"Drunken soldiers and convalescents were most subject to fever. Those patients in this fever who had large ulcers on their backs or limbs generally recovered."

Dr. Rush met with several instances of buboes, also ulcers in the throat, which were mistaken by some of the junior surgeons for venereal sores, but they yielded to the common remedies of the hospital fever. These ulcers, etc., being doubtless the results of land scurvy, were cured by proper diet, etc.

"There were many instances of patients in this fever who suddenly fell down dead upon being moved, without any previous symptoms of approaching dissolution. This was more

especially the case when they arose to go to stool."

This should be prevented by the use of suitable bed-pans, keeping the patient horizontal.

"The contagion of this fever was frequently conveyed from the hospital to the camp by means of blankets and clothes."

As well observed by Miss Nightingale, what does "contagion" mean? It implies the communication of disease from person to person by contact: it presupposes the existence of certain germs like the sporules of fungi, which can be bottled up and conveyed any distance attached to clothing, to merchandise, especially to woollen stuffs, for which it is supposed to have a particular affection, and to feathers, which, of all articles, it especially loves—so much so that, according to quarantine laws, a live goose may be safely introduced from a plague country; but, if it happen to be eaten on the voyage, its feathers cannot be admitted without danger to the entire community. There is no end, to the absurdities connected with this doctrine; suffice it to say, then, that, in the ordinary sense of the word, there is no proof—such as would be admitted in any scientific inquiry—that there is any such thing as "contagion."

"Those black soldiers who had been previously slaves died in greater proportion by this fever, or had a much slower recovery from it than the same number of white soldiers.

"The remedies which appeared to do most service in this disease were emetics of tartar-emetic, gentle doses of laxative salts, Peruvian bark, wine, carbonate of ammonia, opium, and blisters. An emetic seldom failed of checking this fever if exhibited while it was in a *forming* state, and before the patient was confined to bed.

"Many causes concurred to produce and increase this fever, such as the want of cleanliness, excessive fatigue, the ignorance or negligence of officers in providing suitable diet and accommodations for their men, the general use of linen instead of *woolen clothes* in the summer months, and the crowding too many patients together in one hospital, with such other inconveniences and abuses as usually follow the union of the *purveying and directing* departments of hospitals in the same persons. But there is one cause of this fever which remains to be mentioned, and that is the sudden assembling of a great number of persons together of different habits and manners, as the soldiers of the American army were in the years 1776 and 1777. Doctor Blane informs us, in his observations upon the diseases of seamen, 'that it sometimes happens that a ship, with a long-established crew, shall be very *healthy*, yet if stran-

gers are introduced among them, who are also *healthy*, sickness will be mutually produced.' The history of diseases furnishes many proofs of the truth of this assertion.*

"It is very remarkable that, while the American army at Cambridge, in the year 1775, consisted only of New England men, whose habits and manners were the same, there was scarcely any sickness among them. It was not till the troops of the Eastern, Middle, and Southern States met at New York and Ticonderoga, in the year 1776, that the typhus became universal, and spread with such peculiar mortality in the armies of the United States.

"The dysentery prevailed in the summer of 1777 in the military hospitals of New Jersey, but with very few instances of mortality. The dysentery was frequently followed by obstinate diarrhoea, in which the warm bath was found, in many cases, to be an effectual remedy.

"In gun-shot wounds of the joints, W. Ranby's advice of amputating the limb was followed with success. Dr. Rush saw two cases of death where the advice was neglected. There was one instance of a soldier who lost his hearing, and another of a soldier who had been deaf who recovered his hearing by the noise of artillery in battle.

"Those soldiers who were billeted in private houses generally escaped the hospital fever, and recovered soonest from all their diseases. In fevers and dysenteries, those soldiers recovered most certainly and most speedily who lay at the greatest distance from the walls of the hospital.

"Soldiers are but little more than adult children. That officer, therefore, will best perform his duty to his men who obliges them to take the most care of their *health*.

"Hospitals are the sinks of human life in an army. They robbed the United States of more citizens than the sword.

"Humanity, economy, and philosophy, all concur in giving a preference to the conveniences and wholesome air of private houses; and, should war continue to be the absurd and unchristian mode of deciding national disputes, it is to be hoped that the progress of science will so far mitigate one of its greatest calamities as to produce an abolition of hospitals for acute diseases.

"Perhaps there are no causes of sickness in which reason and religion do not forbid the seclusion of our fellow-creatures from the offices of humanity in private families, except where they labor under the calamities of madness and the venereal disease, or where they are the subjects of some of the operations of surgery."

* Cleanliness is founded on a natural aversion to what is unseemly and offensive in the persons of others; and there seems, also, to be an instinctive horror at strangers, implanted in human nature for the same purpose, as is visible in young children and uncultivated people. In the early ages of Rome, the same word signified both a stranger and an enemy.—*Dr. Blane*, p. 225.

These observations of Dr. Rush's upon the subject of the hospitals of his day were too true, and even down to our day there are but few hospitals built upon correct principles. During a recent visit to Europe, but one of the hospitals was found a fit receptacle for cases of acute diseases; this was in France—that of Lareboisière at Paris; in it we have what Dr. Rush desired, separate houses or hospitals—six of them containing each only about one hundred sick. The squares within these hospitals and the spaces between the pavilions are laid out in grounds. All the blocks are joined together by a glazed corridor along the lower flat, and by an open terrace above for convalescents taking exercise. The only defect of this model hospital is that it is built in the city of Paris. No general hospital, at the present day, should be erected within a city, and especially a military one.

CHAPTER II.

HOSPITAL CONSTRUCTION.

Hospitals are divided into—1st, General, and, 2d, Flying. To the first are assigned a medical staff, distinct from that immediately attached to the line of the army. The second are those hospitals attached to the army during active operations. Of this class we shall say but little, as they are but make-shifts at best, depending upon many contingencies, on account of being easily removed. During the summer, from June until September, large tents of India-rubber or oil-cloth have been found the most convenient. In some cases large barns, as before spoken of, were found useful field hospitals. Surgeon Mann, U. S. A., says:

"The sick and wounded were as comfortably lodged as they would have been in a dwelling-house, and much less incommoded by the heat of the weather, which was very oppressive (1812) at times, during July and August. Through the spacious and lofty rooms, by means of large double doors on each side of the barn, a free circulation of air was admitted, which was not only grateful but salubrious."

The New French Ambulance, or Flying Hospital.—The word is derived from the French *ambulance*, to walk. The following is a description of the ambulance which was employed by the French army in Algeria. It resembles a large-sized omnibus to be drawn by two or more horses, weighing twelve hundred pounds, but constructed that it can be detached into sepa-

rate portions like an ordinary wardrobe. In the interior we have a row of beds, carrying six or eight men with great ease, but, when crowded, may be made to hold, as in our ordinary omnibus, twice or even three times the number. Each bed is a "field-stretcher," or portable cot, which, by means of the guard, takes the wounded man from the field and fits in its proper place in the ambulance, without any fatiguing change. By having these cots or beds to hold water, being of India-rubber, the patient with a fracture can be carried with great ease. If water cannot be obtained, it should be so arranged as to be blown up with air, and having rings attached so that a soldier's musket will fit into them, can be carried on the shoulders of the men.

Larrey, in his memoirs of his campaign in Poland, says :

"From Golominn, the Imperial Guard continued to advance on Pulstuck. The roads became worse after we left that city. It continued to rain incessantly upon us, and we continued to march through a thick clay that came up to the girths of the horses, in which the artillery was every moment mired, and a great number of the baggage-wagons stuck fast. Our army never performed a more difficult and tedious march. Under these circumstances, the advantages of our small ambulance carriages were evident, as they were fixed on two wheels, and, from their height and lightness, traveled more easily than the carriages with four wheels, or even the bat-horses."

The four-wheeled ambulance is found best for flat countries, but the two wheels for irregular or mountainous countries. Larrey, who invented the first ambulance during his campaign on the Rhine, 1789 and 1792, states that each division of ambulance consisted of twelve light carriages on springs. The large sized, with four wheels, resembled an elongated cube, curved on the top, with two small windows on each side, a folding-door opened before and behind. The floor, like the present, was moveable, and on it was placed a hair mattress and a bolster of the same, covered with leather, (a great improvement would be the substituting of air or water.) The floor moved easily on the two sides of the body, by means of four small rollers; on the sides were four iron handles, (rings that would fall or fit in the wood would be better,) through which the sashes of the soldiers were passed while pulling the wounded on the sliding floor, (as our soldiers do not wear sashes, the use of their musket as handles is, I think, better.) When the army was engaged in rugged moun-

tains, it was found indispensably necessary to have mules or pack-horses with panniers to carry materials for dressings, with surgical instruments, etc. The trappings of a horse belonging to an officer of the medical staff, were a French saddle, with a cloth, similar in color to the uniform of the rider, edged with gold lace of various extent, according to the grade of the officer; instead of holsters for pistols, Larrey supplied them with couriers'-bags, which were more useful; they were covered with a holster-cap, edged with lace. A small leather portmanteau (or medical saddle-bag or trunk) was also fixed to the saddle. This contained dressings, and might easily be opened without loosening the straps which made it fast to the saddle. Such an arrangement would be well for our surgeons or their assistants.

Hospital Construction.—The best principle of hospital construction is that of separate pavilions, placed side by side, or in line. The former is preferable. It diminishes the distance to traverse from block to block. The distance between the blocks should be not less than double the height of the ward.

There should not be more than two flats to the block, or more than one ward to each flat. There is, however, no objection to having seventy to eighty sick under one roof. For the sake of economy, it might be necessary to build each pavilion with three flats instead of two, although two flats are more convenient for administration. For the purposes of administration, the building ought to be in a square; the basement story connected all round by an arched corridor, with open terrace above. The whole hospital should be erected upon an arched basement.

A hospital, formed of separate pavilions, could be built in line, provided large, roomy, well-ventilated, and well-lighted staircases intervened between each two pavilions.

This is the plan of the new military hospital at Vincennes, which, however, forms three sides of a square. This hospital has only one kitchen. That not more than one hundred patients can, with safety and facility of administration, be massed under one roof, has come to be an acknowledged principle of hospital construction. Buildings of two flats are most compatible with perfect sanitary condition.

Of the Number of Sick which a Ward should contain for Health, Discipline, and Administration.—The best size of wards for ensuring the two conditions of health and facility of discipline, is for the accommodation of from twenty to thirty-two sick.

Wards containing fewer than twenty beds both multiply the attendance unnecessarily, and interfere with proper ventilation, in proportion to the number of patients. Wards larger than thirty-two beds are undesirable, because they are more difficult and expensive to ventilate.

It has been proven by experience that the presence of head-nurses, whether male or female, one to each ward, is essential to discipline. It is very desirable, for purposes of discipline, that men of the same regiment should not be placed together in the same small wards or general hospital.

It may be asked, Why should not all the sick be placed in one ward, provided there be cubic space enough? The answer is, With from twenty to thirty-two sick a height of fifteen to seventeen feet is enough, but it would not be enough for more, and height always involves expense. The greatest economy and the greatest safety to patients is in the above number.

The Amount of Cubic Space for each Bed.—The cubic space for each patient in this climate has been fixed by European sanitary science at not less than fifteen hundred feet.

A good proportion for a ward of twenty patients would be eighty feet long, twenty-five feet wide, and sixteen feet high. This would give sixteen hundred cubic feet to each bed. It would give thirteen feet between foot and foot, which is not too much where there is a clinical school. It would give an average of sixteen feet to each two beds in width.

Half of the sick are to be on each side of the ward.

The Best Proportion of Windows to Beds, with the Relative Position of Windows and Beds.—One window should be allowed for every two beds; the windows to be not less than four feet eight inches wide, within two or three feet of the floor, so that the patient can see out, and should reach to the ceiling. The pair of beds between the windows to be not less than three feet apart. Miasma, with good ventilation, will not be found to extend much beyond three feet from the patient, although from the excretions, it may extend a greater distance. Windows are

to be placed opposite each other. Wire-gauze across the open part of the window will afford an extent of surface for ventilation not otherwise to be obtained, and preclude all possibility of draught upon the patient.

Windows opening as at Middlesex and Guy's Hospitals, in London, in three or more sections, with an iron casting outside, to prevent delirious patients from throwing themselves out, are the best form of window.

No part of the ward ought to be dark. For the purpose of ensuring a sufficiency of light, the walls should always be white, excepting, perhaps, for some few cases of ophthalmia.

The Best Material for the Internal Walls and Ceilings of Wards.—Impervious wards are of the first importance for hospitals. The walls should be of *Parian* or other similar cement, or glazed tiles. Bricks, as used at the Portsmouth Hospital, is highly objectionable from its porous character. Plaster is objectionable from the same circumstance; it absorbs organic matter. Both require very frequent lime-washing to keep them healthy. Glazed bricks would answer a good purpose.

The Best Material for the Flooring of Wards.—Oak wood, well seasoned, is the best; no sawdust, or other organic matter, capable of rotting, should be placed underneath the floor.

Concrete, or some similar indestructible substance, would be the best for the purpose.

The reason for using oakwood is that it is capable of absorbing but a very small quantity of water. And it is very desirable to diminish even that capability, by saturating it with beeswax and turpentine. Beeswax is an invaluable substance. This kind of floor should be cleaned like the French parquet, by frottage.

A hospital floor should never be scoured. A very good hospital-floor is that used at Berlin, which is oiled, laquered, and polished, so as to resemble French polish. It is wet-rubbed and dry-rubbed every morning, which removes the dust. Its only objection is its want of durability.

The stairs and landings should be of stone or marble. The corridors should be floored with diamond-shaped flags or tiles, which are more durable than those laid in the usual manner.

The terrace might be either covered with asphalt or glazed tiles.

The Accommodation for Nurses—Extra Diet and Clean Linen.—There should be a nurse's room,

and a small scullery attached to each ward, also a press in the ward. Baths should be attached to the hospital. The baths should be separated from the pavilion, but connected by the corridor. The walls and ceilings of the bath-rooms should be of fine white cement, or some similar material, and the floors of tile. They should be suitably ventilated and warmed. They should contain hot and cold water baths, sulphurous water, hot air, medicated and vapor baths, shower-baths, and douche. There should also be a portable bath to each ward.

The Best Form of Hospital Kitchen.—The kitchen should be placed away from the ward. Its walls and ceilings should be of pure white cement, for plaster has a tendency to fall off, from the vapor and effluvia of the kitchen. The cooking apparatus, boilers, etc., if placed in the centre of the kitchen, instead of against the walls, will afford twice the amount of fire-space.

The Best Form of Laundry for a Hospital.—No reliable comparison has yet been made between the French system, adopted at the Salpêtrière and Lariboisière Hospitals, and the English system. The French consists in filtering hot ley through the clothes, which are placed for that purpose in large tubs, with a compartment at the bottom, from which the ley is pumped up by machinery, and allowed to flow over the top of the linen, through which it filters into the compartment, to be again raised by the machine. This plan is stated to be the most economical which has been tried in Paris.

There are several good plans in use in the British hospitals. The essential characteristic of the Haslar Naval Hospital laundry is boiling by steam, the linen being afterwards placed in a rotary washing machine.

Another method in use at the Wellington Barracks, where the washing of the Guards barracks and hospital is done, consists in passing the linen through slowly-rotating washing tubs, in which it undergoes a process of *walking* by wooden rods. This plan is both economical and effectual. It is a further question in army matters whether the men should not be trained to do as much as possible by hand, so as to be serviceable in the field where machines cannot be had.

The Best Kind of Bedstead and Bedding.—Iron bedsteads and hair mattresses.

Ward Furniture.—Oak furniture is decidedly the best. The less ward furniture, generally

speaking, the better. For all purposes of eating, drinking, and washing, glass or earthenware are to be preferred. Tin vessels of certain kinds cannot, by any amount of cleaning, be freed from smell.

Water Supply and Drainage.—The water should either be drawn from a tank, at a distance from the hospital, or from a main under pressure, but never from a cistern within the hospital. *No drain should ever pass under a hospital.*

The Best Position for the Water-closets.—The water-closets should be placed at the end of the ward opposite the entrance, and separated by a lighted and ventilated lobby. They should be of the best construction, self-acting. Adjoining should be a small bath-room for bad cases and lavatory.

The Best System of Ventilation for a Hospital.—The doors, windows, and fire-places should be the means of ventilation for such ward as these; nothing else is wanted.

The Best System of Warming for a Hospital.—Radiation; open fire-places. Heated air from metal surfaces should never be used for warming. It has a tendency to produce disease of the lungs.*

To what extent and in what manner can Female Nursing be rendered available in General Hospitals attached to an Army in the Field or at Home?—Florence Nightingale informs us that female nursing might be introduced in general hospitals, both at home and in the field, if only women of the efficiency, responsibility, and character of head nurses in civil hospitals be appointed. Say one to not less than twenty-five bad cases; the orderlies doing under the head female nurse the duty done in civil hospitals by assistant-nurses. But the head female nurse must be in charge of all that pertains to the bedside of the patient, of his cleanliness, of his bed and utensils, of the administration of medicine, of food, of the minor dressing not performed by the surgeon; in short, of all that concerns the personal obedience of the patient to the orders of the surgeon. She must accompany the surgeon on his visits and receive his orders. She must also be in charge of the ventilation and warming of the ward. She must report any disobedience of the orderlies, as far

* Evidence given before the Royal Commission by Miss Nightingale, affecting the sanitary condition of the army and hospitals.

as regards the patient's personal treatment. There need be no clashing with the ward-master or hospital-sergeant. On the contrary, it would be the duty of these to enforce the nurses' authority. They will have enough to do, besides, with returns and accounts, and with enforcing discipline as to hours, meals, clothing, etc., among the orderlies out of the ward.

The female nurses should be, of course, under a female head, whose duties must be carefully arranged, so as to be in accordance with the code of hospital regulations.

Miss N. is of the opinion, from careful study and investigation, that female nursing could not be employed with advantage in regimental hospitals.

On the Regulation of Barracks.—"No barracks, however roomy, can dispense with ventilation; they will inevitably become unhealthy if deprived of it, and the most important of the injurious results in the Schleswig-Holstein war were the formidable pestilences of typhus fever and granular ophthalmia.

"In the best barracks of the Schleswig-Holstein infantry, 700 cubic feet per man were provided, including the double purpose of residence and sleep, and it was not difficult to obtain 800 on the occasional appearance of granular ophthalmia. In the English regulations of 1859, 600 are established by government. It is of great importance to have the sleeping and the sitting rooms separate, so as to subject the bedding to currents of air.

"According to the regulations of the U. S. Army; (1861,) for barracks and quarters: To every six non-commissioned officers, musicians, and privates, servants, and washerwoman, 225 square feet of room, north of 38° N., and 256 square feet south of that latitude.

"A high, dry, well-drained situation, is required without hollows, that can contain water, without mud, and protected from the drainage of neighboring grounds. Abundance of good drinking water must be accessible. The size of the grounds will depend on the situation; but it is the more important as impediment to ventilation exists. A southern exposure, admitting of a majority of the windows in that side, is the best; next to this a south-eastern. Taste should never be allowed to interfere with this. It will be recollected that the ocean lies on a different side from that which it occupies in the United States. The barracks should in-

clude no hollow square, or much projecting wings, never to exceed a projection of 25 feet; 500 feet should be allowed for the sleeping-rooms, and 300 for the day rooms; with large communicating openings near the ceiling, closed with Venetian blinds, to be left open in summer, after airing the day-rooms. All the rooms should be on the southerly side, with the corridor on the north.

"The windows of the corridor must be opposite the doors of the rooms, which should be folding-doors. The utmost deviation from these rules which can be permitted is the construction of two short wings to contain small chambers. For economy, the chambers should be made somewhat deep from north to south, and proportionably narrower in the other direction. The whole building should, for the sake of health, be made with deep cellars—if a perfect drainage be accessible, the washing-rooms should be placed there; if not, in the small projecting wings at the end, which should have solid floors, without cellars, and be themselves well drained. The bath-rooms should have hot water from the kitchen. The privies should be separate from the urinary funnels; and both remote from the dwelling-house. A stream of water should run through the bottom of the urinary conveniences. The apothecaries' shop must have good light, and a surface of at least 350 square feet. Large buildings have recently been erected in Hanover, in accordance with these rules, and supplied with a parade ground of fifty acres. Dr. Stromeyer defends the building of hospitals two to three stories high from motives of economy, and his hospital, including a basement, is four stories high, and he objects to Miss Nightingale's plan, from its nearly doubling the cost of erection. In addition to this, he conceives physicians called upon to oppose it, because, as he says, it excludes the use of smaller individual rooms for separating patients. In his opinion, the rise of effluvia from one floor to those above it, is in no degree to be feared, if simply each different story is properly ventilated."*

The space allowed to English hospitals averages 950 feet. Hennen says eight hundred feet will do, but Ballingall thinks that bedridden patients should be allowed one hundred.

CHAPTER III.

MEDICAL DISEASES OF THE ARMY.

Troops are more liable to enteric disorders than

* Stromeyer's *Maxims of Military Surgery*, N. A. Medico-Chirurgical Review for May, p. 428.

persons in civil life. "The higher ratio of sickness, in general, among troops in the field than among civilians, is more attributable to their constant and severe duties, and greater exposure to morbid influences, than to peculiarities of climate. Also, the ratio of *cases under treatment* among troops and among citizens is higher in the former than in the latter. And this may be accounted for, in a great measure, by the fact, that among the working classes of middle life, those cases only are recorded and enter into statistical data, which interfere with or prohibit manual labor, whereas among soldiers the slightest cases of indisposition are reported. In the latter case, an admission on the sick list secures an exemption from labor, while in the former it occasions a loss of wages."^{*}

Soldiers are liable to all the diseases that civilians are; but the diseases most incident to troops are those connected with the digestive system, then follows those of the respiratory system, and, lastly, fevers; we shall, therefore, treat them in this order, giving but a synopsis, intended more as a medical remembrance to the young surgeon in the hospital or in the field, in case of emergencies, with their immediate treatment. The medical and surgical practitioner has so much to tax his memory with, that he requires, every now and then, to look into some short work that will give him hints in the treatment of his cases.

Diarrhœa.—The great importance of this form of disease is seen by the report of the diseases of our U. S. troops at Cairo, Ill.; for of 772 cases treated, 103 were diarrhœa. This disease is caused by overloading the stomach, or by the use of indigestible food, or a high temperature. The symptoms in the first and second class of cases are the same, namely, griping, flatulence, sometimes nausea, a foul tongue, acrid or foul eructations, stools of unnatural appearance, very liquid or even watery; there is, usually, little or no fever: not much change in the pulse.

In the cases where it results from a high temperature, there is increased stimulation of the liver, and increased secretion from the same, which excites pain and griping in the small intestines. This latter is a very prevalent disease among troops during the hot months of summer and autumn.

Treatment.—At the commencement, administer a teaspoonful of castor oil with a small portion of laudanum, to remove offending matters and relieve pain.

After a day or two of total abstinence from solid food, employing simply rice or barley water, or arrow root, with some local warmth to the stomach, if the diarrhœa persists, vegetable astringents, with chalk and aromatics, are to be employed, with or without an opiate. In cases resulting from heat and moisture, sometimes termed *English* or sporadic cholera, the disease assumes a more severe character, the vomiting and purging, tinged with bile, being profuse, with violent pains and even cramps.

Treatment.—One grain each of opium, calomel, and camphor, every four or six hours, with the *Mistura Cretæ*, or Hope's mixture, a tablespoonful after every alternate evacuation.

Sporadic Cholera.—If the extremities become cold, with feeble pulse, with a tendency to collapse, administer brandy freely, with aromatic spirits of ammonia, and apply frictions to the abdomen, with mustard water or hot brandy and capsicum, with bottles of hot water, until reaction takes place.

The patient's drink should be wine and arrow root, barley or rice water. Afterward treat the fever and debility by liquor ammoniæ acetatis and tonics.

Asiatic Cholera.—This disease differs from the one above described, being much more fatal, and occurring as an epidemic. In the last form of disease treated of, the evacuations were colored with bile, in this, nothing but white or rice colored evacuations; the urine is not suppressed in the former, in this it is suppressed, which is a most distressing symptom; the tongue in the last is usually warm, in this it is cold; and although in a bad case, or in a feeble patient, the face and extremities show signs of a depressed circulation, in this the color is leaden, and the hands and feet sodden like a washerwoman's. In the majority of cases, this disease is preceded by simple diarrhœa, *which should always be promptly treated.*

In the course of the consecutive fever following reaction, an exanthematous rash sometimes makes its appearance, of a typhoid character.

Treatment.—Check the diarrhœa by opium, calomel, and astringents; enjoin strict rest; use arrow root and rice milk, and if there be exhaustion, add brandy or chloroform with oil of turpentine and frictions, and small doses of

^{*} Statistical Report on the Sickness and Mortality in the Army of the United States, 1860.

calomel, until bilious stools are obtained. Afterward, treat symptoms as they arise: chlorine water has been found useful in some cases.

Dysentery of the South in Texas and Florida.—Troops are very liable to this disease, simply arising from the gathering together of large bodies of men, and from heat and moisture.

Assistant-surgeon G. W. Johns, makes the following remarks in relation to the treatment of dysentery, a very formidable disease among troops in and out of camp.

"I may remark, in comparison, that as far as my observation has gone, somewhat different indications for the treatment of dysentery are presented in the disease as seen at this post, from what experience has taught in the management of the same disease as it was observed in the department of Texas, and the difference is with reference to the exhibition and value of mercury. In Texas, particularly the southern portion, irritability of the system appeared to be the chief characteristic, impressed upon the disease by the effect of a climate which is much drier and hotter than that of this locality; and the direct sedative effect of opium, freely used to quiet that state of the system which kept up the disease, combined with acetate of lead and other astringents, to assist (together with astringent injections) in arresting the albuminous discharges, with small doses of ipecacuanha to promote diaphoresis, was found the treatment best adapted to and most successful in dysentery; and mercury was but rarely employed, as it seemed to act as an irritant. In the much more moist climate of this post, (Fort Dallas, Florida,) of which the degree of moisture is even more appreciated by individual sensations than evidenced by the hygrometer, dysentery has been attended with greater derangement of the hepatic functions, and the indications have been for the use of mercury to relieve the portal circulation, and sometimes to employ it to the extent of producing moderate ptyalism." The number of cases of acute dysentery treated was 313 during the year, of which there were lost but 3 cases, or 1 in 104 by the above treatment.

Dr. Rush found the tenesmus much relieved by applying a piece of cotton dipped in equal parts of laudanum and sweet oil to the parts affected. The writer has found useful a suppository of coca butter, with the quarter of a grain of morphia.

Dr. Pringle's treatment of acute dysentery is as follows:

In the first stage a moderate bleeding; but in weakly habits, and where there are few feverish symptoms, this is omitted.

In the evening of the same day an emetic.

R. Pulv. ipecac, - - - ℥i.
Ant. et potass. tart., - gr. j. M.

If there was much griping, the pulv. ipecac. was employed in five grain doses, at an hour's interval, till purging was brought about, which may be promoted by drinking water gruel. If the emetic plan is preferred, and the patient is robust, the operation is to be assisted by repeated draughts of camomile tea.

When the stools are large and bilious, and the patient fatigued with the operation, no medicine is given on the following day. But if the emetic is taken, or there is no bile in the stools, he then directs five grains of calomel with twenty-five of rhubarb.

At night, following the purge, an opiate—one grain of opium—is given with a small quantity of ipecac.

Here he gives an important caution, never to use opiates before the intestines are free. No medicine is ordered on the third day, unless the patient complains of griping, in which case the opiate is repeated at night; but, on the fourth day, if any bad symptoms remain, he again directs the ipecacuanha to be given in divided doses, or a purgative, consisting of eight grains of calomel and thirty of rhubarb; by this time most of the dysenteric causes give way, and sometimes sooner. If not, repeat the same treatment.

Chronic Dysentery.—This is a form of disease which almost all who follow the camp are apt to have. The symptoms are small muco-purulent or bloody stools, alternating with diarrhœa; in its treatment employ small doses of Mass Hydr., with strict rest—diet, rice water, barley water, arrow root, etc.; with flannel roller to the abdomen. Tonics of sulphate of copper, oxide of silver, and sulphate of zinc, in small doses, are useful if there is ulceration, with opium or morphia.

Catarrh, or Acute Bronchitis.—A catarrh, or common cold, is one of the diseases most common to soldiers, owing to their exposure. The mucous membranes in a state of health are moist, but when they become inflamed, they are at first dry, swollen, and then an increase of the natural secretion, which, after a time

becomes unnatural. In catarrh, or common cold, we have the course of events stated above to happen. Sometimes one part of the air passages is affected, beginning at the nose; it may then creep down to the lungs, or passes into the Eustachian tubes, producing deafness, or down the gullet to the stomach. On examination of the chest in catarrh, we have, instead of the gentle respiratory murmur, a hissing, wheezing, or whistling. There is also pain in the head and over the nose. If there has been a decided chill, look out for a severe cough or bronchitis, sometimes pain in the chest from inflammation of the lining membrane, pleurisy, or of the structure of the lungs, which is termed pneumonia.

Catarrh is a common disorder, and troops are apt to suffer very much from it. It is trivial, and with care runs its course in a few days if abstinence be observed from animal food and stimulating liquors, and if the patient remains in an equable temperature, and avoids re-exposure to the cause of his malady. But owing to exposure of the soldiers on duty—defective shoes and blankets—these colds often require the attention of the medical man. The treatment which we have found most efficacious is as follows: a free action on the bowels by a saline purgative, followed in the evening by a teaspoonful of the tinct. opii camphorata; this to be repeated every night after, with or without ten to twenty drops of vin. antimonii or spirits nit. dulc., mixed with sugar and water.

Sore Throat, or Inflammation of the Throat.—The inflammatory *angina* is most frequent and dangerous upon the first encampment. If the symptoms are very severe, and respiration is greatly impeded, and there is danger of suffocation, it requires large and free bleeding, purging, and blistering.

In milder cases employ leeches to the fauces, or counter-irritation by the volatile liniment, consisting of two parts of sweet oil to one of strong spirits of hartshorne applied to the throat, and renewed in four or five hours. By this means, and the use of slippery elm tea or flaxseed, resolution takes place and the swelling subsides. If, on examination, the abscess is found formed, and the lancet cannot reach it, its rupture will be hastened by the use of an emetic, and the patient should be carefully watched so that the pus does not choke him when it breaks.

Intermittent Fever—Ague and Fever.—As well remarked by Assistant-Surgeon R. A. Quinau, in his report of the sanitary condition of Fort Capron, Florida, ague and fever seldom affords cause for alarm, or even seriously excites the anxieties of the patient, but it is nevertheless one of the most vexatious ills which can affect a garrison. His treatment has been quinine in small but efficient doses of two, three, five, or ten grains, and is chiefly relied upon, with suitable exercise, cleanliness, and aeration, with the avoidance of useless exposure to the sun. In his report, the largest number of cases in that region were of the quotidian form; then followed the tertian. Of 1,625 of all fevers, 844 were of the first variety, and 444 of the latter. The number of quartan amounted to 15 in the whole year, of which he lost none by death. To show the intensity of the miasmatic poison which prevailed during the time the post was occupied by Company II, it may be stated that out of two officers and sixty-two enlisted men, (who composed the garrison,) both officers and forty-five enlisted men were seized with the fever. Assistant-Surgeon Asa Wall writes, September, 1857, that the fever was of the intermittent and remittent kind, with occasional tendency to active congestion of important organs. The treatment followed in these latter cases was that pursued by many army surgeons in the old Florida war, viz: quinine in large doses, with such adjuvants as the peculiarities of certain cases required, and observe he that he was "happy to say that this plan of treatment has been successful in the highest degree. I have lost but one patient from the fever, and he died when my supply of quinine was exhausted. It was frequently combined with calomel, which doubtless had a tendency to prevent engorgement of the liver and spleen." As a substitute for quinine, Dr. E. S. Bailey, of Indiana, has introduced nitric acid for the cure of intermittent fever. Dr. Hammond, formerly of the United States army, has published a table, showing the results obtained in the treatment of forty-one cases of intermittent fever at Fort Riley, Kansas Territory, in a period of six weeks in summer; of these forty-one cases, ten were quotidian, and thirty-one tertian. Thirty-one cases were treated with nitric acid, and nine with sulphate of quinine. Of the cases cured by nitric acid, three had previously used quinine without effect, and of those in which quinine had proved successful, nitric acid had

been employed without benefit in two, and in one other had to be omitted on account of causing heart-burn, etc.

The average period of treatment before the disease was permanently arrested was the same with each remedy—three days. The nitric acid was uniformly given in doses of ten drops, (properly diluted with water,) three times per day; the quinine in doses of eight grains, three times per day.”* A caution is necessary in its use, owing to its tendency to injure the teeth. A solution of bi-carbonate of soda should be employed to wash out the mouth after each dose of the acid.

Dr. II. also observes that, “In cases of enlargement of the spleen, consequent upon frequent attacks of the ague, the remedy in question has, in my hands, proved very advantageous.”

Tincture of iodine, or iodine ointment, has been found, by the writer of these articles, a most valuable local application in enlargement of the spleen or liver.

Remittent Fever.—This is also called “bilious remittent” and “bilious fever.” It is truly a camp fever. It is characterized by distinct, yet not entire remissions of all the symptoms about every twenty-four hours.

This fever, is not always easy of diagnosis.

There are two forms depending on the cause, time, and location. It occurs mostly during summer and the fall.

Causes—hot weather; miasm. The first variety of it occurs early in the summer—has not much bilious derangement, but if later in the fall it is attended with bilious symptoms, and is, therefore, bilious remittent, or autumnal remittent.

In the summer remittent, the remissions are less marked than the autumnal, and the liver not so much affected. It does not yield on critical days or by critical sweats. It gets well rapidly and entirely, if properly treated.

The summer variety is made worse by quinine and arsenic. The autumnal is improved by it. The remedies for the summer remittent fever are bleeding, with large doses of calomel.

In the summer form the skin is clear. There may be great gastric disturbance, which is relieved by leeching and ice. In the fall variety, the skin is yellow, with but little nausea and vomiting. In summer variety, delirium and

somnolency occur early. In the fall fever, not so early. Pulse full, frequent, but seldom above one hundred; not hard. There may be diarrhœa or constipation. Tongue white, seldom red, but in the latter stage cracked.

Anomalous Remittent.—This is also called “malignant,” “ataxic,” “pernicious,” and congestive fever, or the cold plague, known well in the south and west of our country, and as our troops proceed South they will be liable to it. The cold stage is often very short, at other times very long, while the succeeding fever is extremely violent; the pulse is hard, full and frequent; eyes dry and red; excruciating pains in head, back and limbs; oppression at the epigastric region; vertigo, tinnitus aurium, with stertorous breathing. There is sometimes apoplectic stupor, coma.

These symptoms may continue for twenty-four hours, when a remission of a short duration occurs, but which almost amounts to an intermission. Sooner or later another exacerbation sets in, and after running a more severe course it ends in a clammy perspiration. If it goes on without molestation, the remission becomes less marked, and great prostration supervenes. Delirium is almost always present, the skin is either pungently hot or clammy cold, and all the signs of typhus fever, petechiæ, vibices, hemorrhage, etc., etc. Another variety is characterized by extreme congestion of the blood in the central organs, early accession of debility, oppressed respiration; small, weak pulse; anxiety, prolonged, cold perspiration; faintness, with cold, livid extremities, with hemorrhages or sero-sanguinolent or rice water discharges: secretions abnormal or irregular.

Treatment.—Great uniformity of opinion exists concerning the exhibition of Peruvian bark, or its preparations. Of sulphate of quinine large quantities are to be given, from \mathfrak{ij} to $\mathfrak{z}\mathfrak{i}\mathfrak{j}$ in a remission, also so combined as to restrain diarrhœa, or open the bowels as the case may require.

The great difficulty is to bring on reaction when the patient is in the fit, but death follows if you do not, and there is a chance for his life if you succeed, and give the quinine. The first blow of the disease falls on the functions of innervation, and second on the capillaries, causing congestion, and the third on the function of calorification. Therefore, for the ataxic or nervous conditions, opium and quinine; for the congestion, cups, leeching, blisters, and sinapisms; for the cold skin, etc., external

* American Journal of the Medical Sciences, April, 1861.

heat, stimulants, frictions of ice in a flannel cloth; calomel is proper when there is deranged condition of the biliary secretions; diet, the most bland nourishing soups, wine whey, beef tea, and milk, but alcoholic stimulants do harm.

Yellow Fever.—The symptoms are slight chills; intense pain in the head, eye-balls and back; injected conjunctiva; tenderness of the epigastrium; incoherency of speech; confusion of intellect; temperature slightly increased; average pulse 80.

Treatment.—Calomel, quinine, and opium, with the usual adjuvants. Out of ten cases treated by Surgeon Charles M'Dougall, four were fatal, six convalescent.

At Fort Moultrie, Surgeon J. B. Porter treated twenty cases of yellow fever; his treatment varying but little from that given above. "In the first stage hot mustard baths were uniformly employed, and were almost always followed by an alleviation of the severe pains in the head, back, and limbs. After the exhibition of a dose of ten grains of calomel, combined with ten grains of quinine, and the employment of the baths, diaphoretics were administered, dry heat applied, and perspiration sedulously promoted till the fever subsided. In some cases the calomel was repeated in small doses, with the view to produce a mercurial impression on the system; but, generally, fatal symptoms presented themselves before this object was attained. In the second stage, brandy, beef-tea, blisters over the stomach, sinapisms to different parts of the body, and all the usual means of stimulation and support were resorted to, to meet emergencies as they arose."

This was the general treatment adopted, but other methods were employed without any better success. It generally commenced about July in the City of Charleston. The troops in Fort Sumpter were also attacked, but the mortality was less.

Typhoid Fever.—This fever is also known by the name of "continued," "enteric," "nervous," mucous and abdominal typhus fever. In olden times it was called typhus mitior, and true typhus was termed gravior. It occurs in spring, summer, and fall, and is termed the red tongued fever in the West.

Symptoms.—Preceding the attack, malaise, disagreeable taste in the mouth, thirst, dis-

charge of mucous from bronchial tubes; tightness across the forehead; lassitude, incapacity of mind; irritability of the nervous system; heat of skin; towards evening, chilliness; defect in the sense of taste; pains in the limbs, back and loins; ringing in the ears; sometimes diarrhoea; never sudden in its attack. Pulse one hundred, slight remissions. There is a peculiar musty odor attending this fever; mind drowsy; delirium, or sleepy in two or three weeks, but sometimes at the onset. There is sometimes low muttering, and sometimes furious delirium. There is great tympanitis with pain over the right iliac fossa, with gurgling; epistaxis, is a common symptom. There is an eruption of taches rouges, or rose spots of the size of the head of a pin. They occur from eight to fifteen days. They differ from the petechiæ, or spots of scurvy or typhus, which occur on the fourth day. In the third week we have complication of bronchitis, pneumonia, ulceration, or perforation of the bowels. This perforation is indicated by thirst, quick pulse, extreme tenderness of abdomen, with vomiting of green or black matter, and arresting the diarrhoea. The other complications are known by the symptoms which have been already described.

The general prognosis is unfavorable; about one out of six die in summer; in winter, one out of three.

Treatment.—Relieve the headache by an emetic; pulv. ipecac, ℥j, with 1 gr. ant. et potass. tart., and if tongue is furred, give purgative of calomel, followed by saline or seidlitz powder, or citrate of magnesia. If fever is very high, with delirium, bleed, apply cold water to the head, cut off the hair, apply leeches to the temples, and use foot-bath.

Keep up gentle action upon the skin with spts. mindereri. When there is a remission, give quiniæ sulphas; attend to diarrhoea by mucilages and tinct. opii, giving alum whey and plumbi acetas et opii.

Diet.—Beef tea, wine whey, and brandy punch, avoiding all solid food, nothing but a liquid diet; keep up the strength, attend to complications, and keep the patient in a well-ventilated room, and he will recover. There is no specific; patients never die from the fever; always from complications.

Typhus Fever.—This is also termed jail and hospital fever. It is characterized by quick,

small pulse, great prostration, and disturbance of the brain.

Its general cause is close air and filth. On this account, in old times, jails and military hospitals were most exposed to it, but proper ventilation and cleanliness have diminished its ravages.

Prodromic Symptoms.—They are chilliness, pain in the head, burning heat, or alternating heat and cold, trembling of the hands, loss or appetite. When the fever has fully developed itself, the odor is ammoniacal or putrid, countenance stupid, skin of dingy appearance, eyes injected. There is no fever but that of the true yellow, which produces the peculiar unpleasant sensation of heat to the fingers on feeling the pulse. The bowels are usually constipated; pulse 100 to 150, but irregular, weak, yet apparently strong, when superficially examined, heart more affected than lungs, being feeble in action. The urine has a muddy, dark hue; no sediment, but containing albumen. The eruption appears upon the fourth day, on the back, and then spreads over the body, reaching the chest last. The eruption is the purpura rubra; pressure will not remove the spots. The blood, when drawn, flows sluggishly, and is very dark in hue, coagulating loosely, rarely buffy, in some instances it looks like molasses.

Prognosis favorable; mortality one in nine. The deeper colored the petechia the more grave. Hemorrhages are unfavorable. It subsides on the 7th, 9th, 14th, and 21st days. Cleanliness and good ventilation will cause it to disappear. It has no specific virus, but is communicable from person to person, if in the same atmosphere.

Treatment.—This fever cannot be arrested in its course when once it shows itself, yet such was the reliance of Dr. Rush, while in the American army, upon an emetic, in curing it in its forming state, that he made it a practice to carry a number of doses of tartar-emetic in his pocket, which he gave to such of the officers and soldiers as complained of the premonitory signs of the fever, and always, he states, with the happiest effects. As it is difficult, in the very early stage, to determine what the form of fever may be, in some instances Dr. Rush must have given the emetic with good effect in incipient bilious, or typhoid fever, which are the most common forms of camp fever, and which are frequently checked

by the administration of an emetic. Our present treatment consists in abating the symptoms, and warding off death, by protecting every organ and restoring the natural condition of the blood and nervous system.

The treatment should be mild, supporting the system by nourishing liquid diet, and above all, attending to cleanliness and ventilation.

On Inflammation of the Brain and Coup de Soleil.—*Phrenitis*, or inflammation of the brain, is properly a summer disease, when men are exposed to the heat of the sun, especially whilst asleep and in liquor.

Great care must here be taken to distinguish true inflammation of the brain from coup de soleil or sun stroke, as the treatment of the first is active depletion, while in the second it is first stimulation with cold to the head and powerful baths to the feet, and the fever which follows is to be treated like inflammatory fever. But there is a symptomatic inflammation of the brain or its membranes, with delirium, which is one of the most general symptoms, which is confined to no season, and happens indifferently in the bilious and other fevers. It is more common in military hospitals than elsewhere, on account of the violence done to all fevers when the sick are carried in wagons from the camp to the hospital, where the very noise, or light alone would be sufficient, with more delicate natures, to raise a phrenzy. Dr. Rush has frequently seen this remark verified. The removal of patients in the first, or violent stage of all fevers, whether in wagons, coaches, or single horse chairs, often induces not only delirium, but precipitates death. A symptomatic phrenitis is to be treated by leeches, cups, and washing the soldier's hands and face with warm vinegar and water, with fomentations to the feet and cold to the head, ice-cap, etc. Blisters are not to be applied until after the acute symptoms have been relieved by depletion, etc. Dr. Rush recommends blisters to the limbs after the partial reduction of the morbid excitement of the brain.

Rheumatism.—This is a most frequent disease, and one easily recognized in the beginning of a campaign. Dr. Stromeyer,* a surgeon of great distinction, who served on the general staff of the Royal Hanoverian army, during the Schleswig-Holstein war, from 1849 to 1851, divided rheumatism into the three following classes:

*Stromeyer's Maxims of Military Surgery, (abstract of Review,) North American Medico-Chirurgical Review, pp. 434, 438.

1. General acute rheumatism of joints.

2. Local rheumatism of joints.

3. Painful rheumatoid condition, without deposits capable of being pointed out.

"General acute rheumatism of joints, declares itself immediately after exposure; after a severe chill on guard, or after a forced march, fever and swelling of the joints come on so rapidly that the subject must be sent immediately to the hospital. The fever is absent in but few cases. Generally the ankles and knees are affected; one knee more severely than the other. The inflammatory process seldom subsides rapidly, but the disease is further developed. Dr. Stromeyer has found, as the rule, that infiltration takes place in the lungs—the indication being obtained by percussion. A fine mucous rattle is generally present, but not in every instance, rarely cough or dyspnoea. The finger-joints, wrists, and elbows are soon seized; then follow affections of the heart.

When cases are daily examined with care, the first evidence of diseased heart is a change of the rhythm of the motions of the organ from a prolongation of the first tone. Here the affection often stops; but if it be further developed, the endocardial rustling is heard. In patients treated early and promptly, as Stromeyer's generally were, pericarditis rarely ensues, and not till there is previously well marked endocarditis. Leeches give much more relief than bleeding. Affections of the brain never appeared among Dr. Stromeyer's cases. But a single death of a rheumatic patient occurred in five hundred and thirty-two instances of rheumatism."

Treatment.—In his experience, the cool treatment of rheumatism proved itself the most important principle of cure. Patients became worse, or were delayed in their recovery in exact proportion to their proximity to the stove. He was, by his success, gradually led to abolish the customary load of bed-clothes; and in summer, even to cover his patients with nothing but a linen sheet, unless, indeed, they asked for a blanket. This procedure had the happiest influence. Until he adopted it, he had frequently the regret to see patients who were admitted for a single affection of one joint become gradually involved, under every medication, in a general rheumatism, accompanied by fever.

Dr. Stromeyer has entirely relinquished general bleeding; not from the production of inconvenient debility by that means, but from

observing its little utility. Leeches were found more useful than cups, from the long continuance of the bleeding; this was kept up by warm wet compresses. As leeches cannot always be had, the artificial leeches should be employed. Still he is far from wishing to restrict the use of cups. Leeches should be applied to the region of the heart as soon as the physical signs of endocarditis appear, without waiting for the occurrence of pain.

Dr. Stromeyer believes opium the only intrinsically effective internal medicine for rheumatism. He reduces the force of the pulse with nitrate and bi-carbonate of soda, and if the tongue be then moist and clean, immediately administers opium. If a deposit begin to form on the tongue, the nitrate of soda is laid aside, phosphoric acid given, and the use of the opium or morphia intermitted, until the tongue again becomes clean and moist. To avoid disappointing patients of their beloved "sleeping powder" they are furnished with pulvis sacchari. A quarter of a grain of the sulphate of morphia, once a day, is generally sufficient; sometimes this being given twice in the same period, but very rarely more frequently. Digitalis is greatly inferior; does not relieve the pain, and disturbs the stomach. Castor oil is used to regulate the bowels, and the diet adjusted according to the pulse. By the cool treatment the profuse sweats are avoided. These, he hopes "none will, at the present day, consider critical." Strong sudorifics should be entirely discarded, more especially during acute affections of the heart; a state of things which is not easy to alleviate with leeches and morphia. Calomel was given for this object, in doses of one grain every two hours, but seldom to a larger amount than twelve such doses.

Local Rheumatism of Joints.—These cases almost always have the form of inflammation of the synovial membrane, or dropsy of the joint, unless they are relapses, or second or later attacks in the same joint. They have generally the appearance of injury of joints from gymnastic exercises. They occur commonly in the knee. Sometimes the inflammation is very severe, and requires repeated local bleedings, the application of ice and the use of mercury to a considerable extent. Against the more chronic form, the principal resources were fomentations with vinegar and water, and sometimes blisters. The use of morphia for pain, and to procure sleep, should not be omitted. In all rheumatic affections of joints great care

is necessary to obtain and preserve proper attitudes for the diseased member. The condition of "being rheumatic"—the pains and impediments to motion, which appear under the form of muscular rheumatism of single joints, or of the thorax, or in that of lumbago or sciatica, were more generally reflex phenomena from the large bowels, which were at the time laboring under a catarrhal affection, and loaded with masses of hardened feces, hard masses were felt on palpation on the surface of the abdomen, and the patients were relieved when these were evacuated. This, however, was not always the case; and the exceptions were mostly treated with a little morphia, and by warm fomentations with cloths wet with a decoction of flaxseed. Sometimes warm baths were used; and in a few obstinate cases, iodide of potassium, oil of turpentine, or corrosive sublimate.

Land Scurvy.—This form of disease will be found among troops who suffer from the want of fresh meat, good flour or bread, and vegetable food in its natural state. The blood becomes depraved and the system debilitated, with a tendency to hemorrhage and a low form of inflammation in various parts of the body.

But little medical treatment is required in this disease. Great cleanliness, diet of sour krout, spinage, celery, garlic, onions, carrots, and potatoes. According to experiments made in the Milbank Penitentiary, by the use of this latter vegetable, the physician in charge succeeded in banishing the disease from it. One of the best applications to the gums is the nitrate of silver or sulphate of copper. A gentle laxative should be given to keep the bowels open.

In the recent report of the sickness and mortality among the United States troops, it is stated, on the authority of Assistant-Surgeon E. W. Johns, that "even vegetable matter, restricted to one form, may not prevent scurvy, as was the case amongst the lime groves at Fort Dallas, Florida, where the parade was covered with lemon, lime, and orange trees. With reference to this case, however, as well as his recollection now serves him, the troops at Fort Dallas were without fresh beef, and the flour was bad.

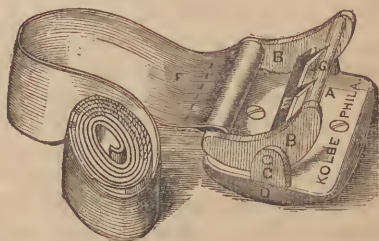
Potash, he also observes, and citric acid, in his experience of several years in Texas, had not the slightest value. He believes that the greatest developing cause, in the case of the soldier, is guard-duty at night.

It was found by Dr. John J. Gaensten, while on duty at Camp Cooper, on the Clear Fork of the Brazos, that "in the absence of such anti-scorbutics as the army is usually supplied with, a remedy, free of cost, was found close by in abundance. The young and tender shoots of *phytolacca*, and of the various species of *rumex* were recommended, and when prepared, were freely eaten; one patient, unable either to walk or to discern objects, on the free use of the articles mentioned, was returned for duty in four weeks."

SECTION IV.

Surgical Diseases and Accidents—Brief Hints previous to a Battle and in an Engagement.—The great value of an able and accomplished surgeon, with the requisite presence of mind, willing and ready for any emergency, is never better seen than in the treatment of dangerous wounds received in battle. Many brave men must unavoidably perish from loss of blood and other causes, unless restored, and snatched, as it were, from the very jaws of death. There is no doubt, that the higher the surgeon stands in the opinion of the officers and men, the more willing will they be to risk their lives in action, being confident that every wound or injury they may chance to receive will be properly treated, and their lives, if possible, preserved.

Therefore the surgeon of a regiment should have everything necessary placed in a box or case. The capital instruments should be clean, bright, and in good order, with several tourniquets ready at hand. The following is a most admirable form for field purposes, having been modified by Kolbe, of this city.



The improvement in this field tourniquet, consists in gaining a more direct pressure than in the old form. Letter B, represents a half-circle buckle, and acts as a lever which is attached to a brass plate A, by two upright pieces, C; D, is a well-shaped wooden pad, covered with leather; F, is a strong webbing strap attached to B; G, is a roller which facilitates the application strap.

He should have a number of needles, of all sizes threaded, a roll of patent lint, adhesive strips already cut, double and single headed rollers, and several handkerchiefs, which are most useful in bandaging the head, knee, etc. Each roll of muslin or bandage should have pins in it, so as to be convenient, besides a pin cushion, filled with brass, silver and steel pins; a bottle of good sweet oil. The ether and chloroform should be in bottles, covered with tin cases, with several pieces of fine sponge, oil silk, etc. Also, towels, with cushions of bran, or straw, for dressing fractures. Splints of all sizes, also pieces of tape to secure the splints.

When your enemy is near, you should select a good location, shady, if possible, out of the range of the enemy's guns, and arrange a platform, to operate on, of wood. Cover the ground near it with straw, to lay your wounded men on, and, if possible, cover it with blankets, (never lay them on the cold ground,) so that they need not be disturbed after they are once dressed. Always make your arrangements to have two or three intelligent assistants; also, from six to twelve men to carry any of the men wounded, on litters; and always in removal to a great distance, obtain an ambulance, or a carriage on springs. Never neglect to have an abundance of water near at hand for the wounded men, with brandy, wine, and aromatic spirits of ammonia, and some vinegar, with laudanum, simple cerate; also, tannin, with a solution of the per sulphate of iron, as styptics. See that your assistants are properly instructed in the part they have to act. If a house, barn, or church can be procured, so much the better, but above all have your senses about you, and prevent confusion.

When the battle is once begun, and several wounded are brought to you at a time, always first take care of him who is in the most immediate danger; but, otherwise, dress them as they come, without distinction of rank. If, however, any is brought to you with a limb off, or a violent hæmorrhage, and you happen to be in the midst of an amputation or resection, or other capital operation, order your mate or assistant (for the present) to fix a tourniquet on the main artery supplying the part, and administer stimulants so that the flow of blood may not prove fatal.

Never encourage men to stay near you after their slight wounds are dressed, as there are cowards who with violent groans and complaints would make you believe they are much

injured, who will stay about the surgeons' quarters, afraid of making a severe trial of their courage. Such fellows will, sometimes, try and get some trifling injury so that they may have a plausible excuse for going to the doctor.

When you are about entering on any capital operation, you should use your utmost endeavors to encourage the patient (if he is sensible) by promising him to treat him tenderly, and to operate with the utmost expedition, and promising the best results after it is over; never proceed rashly, or cruelly, and never give unnecessary pain, (using anæsthetics whenever you consider your patient cannot bear pain,) or his system is in a proper condition for them. Dress wounds as lightly as possible, with scraped or patent lint, anointed with oil or simple cerate: do not cover them with large bundles of lint, cotton, or sharpee, so as to produce heat in the part.

When the action is over, you should go round among your patients and examine if the wounds have bled much. If the hæmorrhage still continues, remove the dressings, and ligate any small artery, which sometimes shows itself. After full reaction has taken place, also apply clean dressings. The tourniquets should still remain on those patients who have had their limbs amputated or shot off; in case you are deficient in the number of those useful articles, have assistants to watch them, or tie the two ends of a handkerchief together, and place a piece of wood in it, and have it ready to twist, placing a small pad over the main artery; or even let your patient be instructed how to tighten it, if he feels the wound to bleed. By neglecting this caution many valuable lives have been lost on the field of battle, and after important operations.

You must likewise see that those having wounded or fractured limbs, etc., lie easy, and that they are supported with proper diet, drinks, and medicine for symptomatic fever, pain, etc. As soon as possible, after the battle is over, see that your wounded have proper means of transportation to the nearest army hospital, acquainting the officer in command how many there are wounded, and the nature of their wounds, and how many are likely to prove mortal, etc.

Surgical Diseases and Accidents.—We shall now pass to the consideration of surgical diseases and accidents, and first as to the use of agents to relieve pain during operations, called *anæsthetics*.

Although opposed to the indiscriminate use

of anæsthetic medicines, yet when they are employed with proper caution, they are and have been found in military surgery a great blessing. As it relates to chloroform, there can be no doubt that many deaths have occurred from its use alone, where all needful caution have been observed in its administration. Chloroform is a most powerful sedative, and a valuable agent in local application, or in a mixture with sulphuric ether, one part, to two, three, or four parts of pure sulphuric ether, but should not be employed alone. Sulphuric ether is one of the safest and most reliable of this class of agents, and although one or two instances of death are stated to have followed its administration, this is but a very small number considering the vast number of cases in which it has been employed with success since the autumn of 1846, from the simple operation of extracting a tooth to the most extensive and dangerous operation in surgery.

The mischief, in most of the fatal cases from chloroform recorded, we are firmly convinced, results from the density of its vapor producing asphyxia, also its direct and immediate sedative action upon the heart. In administering ether, or chloroform, we should endeavor to have the patient's stomach empty, chest free from any constriction, an abundance of pure air. The system is then brought rapidly under its influence, by applying to the mouth of the patient a large loose sponge well charged with the anæsthetic. If the patient is weak, or feeble, or prostrate from shock, employ heat, brandy, ammonia and wine, to restore the circulation and heart's action, before commencing the inhalation.

Dr. Pitcher, late Surgeon United States Army, writing of his experience in regard to the use of anæsthetics in severe operations in surgery, more especially (chloroform) says: "whenever there is sufficient force in the circulation, and nervous activity to sustain the patient, I would give my voice with the general judgment of the medical profession, by which the use of anæsthetics in the severer operations of surgery is sustained. But regarding them (chloroform) as poisons of a sedative class, which, when introduced into the blood, produce cerebral exhaustion and cardiac syncope, if they do not change the physical and vital properties of the blood itself, I feel obliged to remonstrate against their use in cases of syncope or nervous exhaustion."

Inflammation of the Eyes.—Soldiers are subject

to an ophthalmia or inflammation of the eyes, not only from cold, but from frequent exposure to the night air, sun, and dust.

That resulting from cold is best and most speedily cured by mild aperients, the application of a solution of the nitrate of silver, two to four grains to the ounce of water. If there is much congestion, with headache, leeches or cups are to be applied, with small doses of opium and calomel; if the iris becomes affected, then the soft extract of belladonna must be applied around the brow. In all cases, we should examine carefully by reversing the lids, or with a probe or director, as the inflammation may be either occasioned or kept up by foreign bodies under the lids, or by cilia falling in or growing inwards, which must be removed by a pair of broad toothed forceps.

In the condition called "granular lids," the lid must be inverted and touched alternately with a crystal of sulphate of copper, or 10 to 30 grains of nitrate of silver in solution, at times taking a broad lancet and scarifying the free hypertrophied papillae of the lids, and at night anointing them with the ung. hyd. precip. rub, U. S. P. frequently fomenting the eyes with decoction of poppy heads or chamomile flowers. In the Sanitary Report of the Army from Fort McRae, Florida, Dr. William H. Babcock reports, under the name of "hemeralopia," five cases of what seemed to have exhaustion or debility of the retina from excessive stimulation. The cause of this was undoubtedly the glaring reflection of the sun from the lake and white sand. It was characterized by dimness of vision during the day, accompanied sometimes by spectral figures, and by partial or total blindness after and just before sunset.

All these effectually recovered by simply wearing a green shade before the eyes, and avoiding to use them. In two of the cases, small blisters were applied to the temples with apparent benefit.

Gonorrhœa and Syphilis.—These two diseases are apt to follow the camp and the soldier. He has been the means of their propagation from the earliest times, and is seldom entirely free from them.

Gonorrhœa.—In men it has been divided into four different species, according to the supposed seat of the disorder, or the place of the urethra from whence the discharge comes:—1. From near the point of the urethra. 2. From about an inch above it. 3. From the whole tract of

the urethra up to Cowper's glands. 4. From the prostate glands, and neck of the bladder.

Symptoms.—First an itching at the end of the penis, and a discharge of clear watery liquid, or of a yellowish green colored lymph, soon followed by badly concocted pus, attended with heat and pain in passing water. This is followed at night by a cordée or painful involuntary erection of the penis. If the gonorrhœa is violent, it is attended with swelling all along the perineum, or a swelling of the testicle, and at other times with a phymosis or swelling of the prepuce or paraphymosis.

Treatment.—Maintain an open discharge from the bowels. Fomentations of hot water applied every fifteen or twenty minutes, many times in the 24 hours, on removal, the parts should be covered with a single thickness of soft linen. The patient restricted to a low diet, with entire bodily repose.

Injections of nitrate of silver, 10 grains to the ounce of rose water. The bladder should be emptied immediately before the solution is employed, so that the urethra may have a chance to rest for several hours afterwards; a glass syringe should be used, \mathfrak{zj} . of solution, will be enough. As soon as the operation is completed, let the patient recline on a bed or sofa, and have warm fomentations applied to the parts for two or three hours. If the secretion still continue, and exhibit a puriform character, the injection is to be repeated in twenty-four hours, as on the preceding day. If two injections fail, resort to 3 or 4 gr. solution repeated 3 or 4 times in 24 hours, and be retained 3 or 4 minutes by pressing upon the orifice of the urethra. The point of the syringe should be inserted to the distance of an inch. At the moment the instrument is introduced, the penis should be turned upwards in nearly a perpendicular position between the thumb and finger. If the discharge has existed more than a day and a night before the patient applies for relief, it will be too late to make trial of the revulsive method, we must then administer copaibæ.

℞ Copaibæ, - - - $\mathfrak{f}\mathfrak{z}\mathfrak{iij}$.
Spts. æth. nit., - - - $\mathfrak{f}\mathfrak{z}\mathfrak{ss}$.
Tinct. kino, - - - $\mathfrak{f}\mathfrak{z}\mathfrak{ss}$.
Mist. camphoræ, - - - $\mathfrak{f}\mathfrak{z}\mathfrak{iij}$.
Morphiæ sulphatis, - - gr. v. M.

S. A teaspoonful 3 times a day.

Those who cannot use the liquid balsam, can use the capsules of copaiba or oil of cubebs, which are more efficient than those of copaiba alone.

Acton's favorite prescription is

℞ Copaibæ, - - - $\mathfrak{z}\mathfrak{vj}$.
Magnes. calc., - - - $\mathfrak{z}\mathfrak{iss}$.
Ext. hyoscyami, - - - $\mathfrak{z}\mathfrak{ss}$.
Pulv. camphoræ, - - - $\mathfrak{z}\mathfrak{j}$.
Theriace, - - - $\mathfrak{z}\mathfrak{iij}$.
Micæ panis, - - - $\mathfrak{z}\mathfrak{iss}$. M.

Ft. electuarium. Dose, one drachm 3 times a day.

It must be continued 10 or 12 days after the blennorrhagia has entirely ceased, injections being used as adjuncts. Or

℞ Pulveris cubebæ, - $\mathfrak{z}\mathfrak{viiij}$.
" cinnamomi, - $\mathfrak{z}\mathfrak{j}$.
" aluminis, - $\mathfrak{z}\mathfrak{j}$. M.

Div. in chart, No. xxxij. S. One powder 3 times a day, assisted by the following injection.

℞ Plumbi acetatis
Zinci sulphatis, \mathfrak{aa} - gr. \mathfrak{iij} .
Aquæ rosar., - $\mathfrak{f}\mathfrak{z}\mathfrak{vj}$.

Use 3 times a day, with a Syringe.

In gleet, blister by cantharidal collodeon applied by means of a camel's hair pencil along the whole length of the canal, except two or three lines at the orifice, weak injection, as follows:

℞ Aquæ. - - - $\mathfrak{f}\mathfrak{z}\mathfrak{viiij}$.
Acid. nit. - - - gtt. xx. M.

Syphilis; or the Venereal Disease.—This disease, it is stated, was brought by the returning soldiers from the siege of Naples. In our condensed and general view of this subject, it obviously resolves itself into two great divisions: Local and Constitutional.

When local, it consists of four varieties of sores or chancre.—1st, Follicular; 2d, Phagedænic; 3d, Indurated; 4th, Simple Abscess or Furunculus.

Follicular, on the first day, appears as a small pimple; on the second or third day, becomes open pureform. It is inflamed red as scarlet. Do not use nitrate of silver in this state, as it will produce phagadæna. The proper treatment is to bleed, purge, low diet, applying cold locally unless it should produce chills, then use warm fomentations. When the inflammation has been reduced, destroy by local caustics; the best of these is caustic potash, or sulphuric acid, with charcoal, and dress with lint dipped in water, with vinegar or aromatic wine.

If it refuse to heal, edges open and everted, there is a want of healthy plasma; use half a grain hydrargyri protiodidi night and morning; black wash, and pure port or aromatic wine as local stimulants.

Stop the mercurial when the gums are sore; if it purge or gripe, combine opium or lactucarium with it. If the patient is feeble, use ferri tart. gr. vi., twice or three times a day; taking care that the mercurial is not employed to excess, from ʒss. to ʒj. is usually sufficient. If it produces fatigue, large red blotches on the skin, pains in the bones, stop its use.

2d.—Phagedenic is of two kinds, white and black sloughs; dependent always upon some constitutional vice, as scrofula, intemperance, syphilis, etc.

Do not purge, starve, bleed, or use mercury, unless combined with tonics and stimulants, as Peruvian bark and its salts, iodide of iron, potassium, oil jecoris, etc. Locally, rest position, yeast poultice, equal parts, tinct. iodine and alcohol, sulphate of copper, or, when it is melting away, apply collodion to exclude air, but no warm or greasy applications.

To remove smell and restore tone, apply a wash of liquor soda ch. or solution of chloride of lime.

Constitutional.—3d. Indurated lump under the skin, or ulcer with hard base. Rely on constitutional treatment. Locally apply dry powder, as calomel, with opium or morphia; no greasy application. Require two to six weeks treatment, use mercury; the bi chloride of mercury is one of the best preparations to employ some time; use it until the hardness is gone, and for two weeks after.

4th.—Furunculus, boil, or abscess. In its first stage, treat it in same manner as an ulcer; but you will find it not so easy to cure. Always attend to the condition of the constitution. Employ mercury until the ulcer, if open, is disposed to heal. After it has healed, use the mercurial as long as it took to heal it, to prevent secondary symptoms. If unable to salivate with the bi chloride or the iodide, employ the cinnabar by fumigations, by placing it on a heated iron weight or piece of iron, and placing a funnel over it, and inhaling it with the vapor of water.

Secondary symptoms of Hunter; Tertiary of Ricord, first bubo or purplish tumor in groin, one or both, even without sore on penis; but we are more certain of its nature when there is an ulcer on the penis, and can trace its history from impure connection.

Treatment:—Keep the patient in bed, leech, purge, low diet; employ the mercurial for two or three weeks, apply ung. hydr. to the swel-

ling. If this fail, and suppuration is likely to ensue, apply blister, mercurial plaster, tinct. iodine and alcohol, equal parts. If suppuration is still likely, open it. Puncture it with a lancet, and give the mercurial in tincture of bark. After puncture, use dry lint and aromatic wine, with poultice of flaxseed meal. Open all sinuses, apply sulphate of copper, and pare off the edges of the wound, and again apply lint, with aromatic wine.

Neglected or improperly treated bubo is followed by other secondary diseases, as ulcerated sore throat or tonsils, skin diseases, syphilitic eruptions. 1st, Roseola syphilitica; 2d, Vesicular do.; 3d, Rupia do.; 4, Lichen do.; 5th, Tubercular do.; caries of the bones of the nose, head, and jaw.

The treatment of almost all skin diseases, is by changing the condition of the blood; also employ sulphur, vapor, and warm baths three times per week. Among the best means for producing this change, are

R Potasii iodidi gr. v., in a large tumbler of water or hop tea, three times a day; or the hpd. bi chloridi, given in officinal solution, with decoction of guaiacum; or, best of all for chronic skin affections, is the decoction of Zittman.

Its mode of preparation is as follows:

Decoctum fortior.

R.—Sarsaparillæ radicis concisæ, ʒ iv.
Aque fontanæ, - - - 0 xxiv.
Coque pér quartam horæ partem, Et adde Aluminis.
Sacchari albi, āā - ʒ vj.
Hydrargyri chloridi mitis, ʒ iv.
Antimonii oxysulphureti, ʒ j.
In nodulo ligato, sub fine coctionis admisce.
Sennæ foliorum, - - ʒ iij.
Glycyrrhizæ radicis, - ʒ iss.
Anisi seminim.
Fœniculi seminim, āā - ʒ ss.
Decoque ad octaria, - - xvi, et cola.

Decoctum tenue.

R.—Decocti fortioris residui.
Sarsaparillæ radicis, - ʒ vj.
Aque fontanæ, - - 0 xxiv.
Coque, et sub fine coctionis, adde Pulveris corticis citronum.
Pulveris cinnamomi.
Pulveris cardamomum, āā ʒ iij.
Glycyrrhizæ radicis, - ʒ vi.
Decoque ad octaria, - - xvj, et cola.

After a dose of calomel and jalap pills, drink from a pint to two quarts a day, in the morning taken warm and in the evening cold. In ulcerations of the throat, use the same treatment, applying solutio argenti nitratis ʒij. to f ʒj. water. In the case of condylomatous tumors around the anus, cut off and apply

calomel and powdered gum Arabic or chloride of zinc in solution. Venereal warts on penis, which look like raspberries, cut them off, or apply nitric acid with a piece of wood, or nitrate of mercury or silver with dry lint. Larvated or masked chancres or ulcers in the urethra, if not cured by injections, use Lallemand's port caustic.

In syphilitic caries, use constitutional treatment, and treat locally in the same manner as when arising from other causes.

General Nature and Treatment of Wounds.—In our observations on the preparatory steps previous to and during an engagement, we dwelt upon the great importance of the tourniquet and its proper construction. The following observation of the great military surgeon, Hennen, should be carefully looked to by the field-surgeon:—"The straps of the screw-tourniquet, usually put in instrument-cases, are often defective, and their buckles unsafe; they should be carefully proven before using, lest they should give way at a critical period of an operation. The clumsy pieces of leather, added to some, are entirely useless; but a small, neat pad, secured with a bit of tape, may be retained." He also recommends the tenaculum of Assalini and the artery-forceps, with a slide.

The wounded, after a general engagement, may be calculated at the rate of ten per cent.; see, therefore, that no wounded man bleeds to death for want of a tourniquet. In a large body of troops, wounds of all kinds occur, being received both in and out of camp; we shall, therefore, enter upon, first, the

General Consideration of Wounds; but especially those received on the battle-field; and we sincerely trust that the humane surgeon will never hesitate to carry the comforts of this noble art into the very midst of the combatants, and that our government will reward such acts of bravery. Let no one enter the service because it is free from danger; for, if the surgeon will do his duty, he must accompany his regiment until the action commences, and then only retire to some comparative place of safety.

Several instances are on record in which the medical officer has been killed in discharge of his duty upon the battle-field; and others in which, on the death of the proper officer, the medical man has not hesitated to take command, and faced the batteries of the enemy.

Cooper defines a wound to be a recent solu-

tion of continuity in soft parts, arising from an external cause, and generally disposed to bleed. There are exceptions to this definition, as, for instance, muscles are lacerated by their own contraction, and the integuments are pierced by the projection of fractured bones through them. Wounds are divisible into various classes—first, according to the agent producing them; second, the character of the wound; third, the location in which it occurs. They are also divided into the simple and complicated. The simple meaning merely division of integuments; the complicated are accompanied with injuries to blood-vessels, nerves, luxations, and fractures.

The danger of wounds depends, first, on their size—the larger the more danger. If a wound, for instance, is six or eight inches long, it is always dangerous to life, as erysipelatous inflammation is liable to set in. Second, upon the weakness or strength of the organization of the parts involved. In bone, cartilages, and tissues of low organization, they are ten times more severe than when occurring in skin, muscle, etc. Third, upon the importance of the organs involved. Those of the vital organs are apt to be followed by death. If it be in the head, and confined to the cerebrum, patients often recover; but, if the base of the brain or cerebellum, the patient is almost sure to die. A shot in the stomach is ten times more dangerous than in the intestines. Fourth, upon the kind of blood-vessel wounded; if an artery, there is danger of immediate death from hemorrhage, unless the vessel is ligated, or can be impressed; still the danger is greater, in prospect, from a lacerated vein, as phlebitis or metastatic abscess may ensue. Fifth, on the diathesis of the patient, always ascertain, if possible, whether the wounds of your patient bleed profusely or suppurate much, instead of healing kindly. Some patients are very prone to inflammatory action. Sixth, upon the age; youth is more favorable for operations; after fifty, there is greater danger of non-union in extensive wounds.

The causes of death in wounds are hemorrhage, tetanus, traumatic or symptomatic fever, erysipelatous inflammation, hectic fever, gangrene, and metastatic abscess. This latter occurs, after amputations, in the head, chest, or abdominal viscera. If there be pain, loss of respiratory murmur, and dullness on percussion in the chest, you are apt to have a local abscess forming. No matter how extensive or trivial a

wound may be, treat it carefully as soon as called to it; obey the injunction of Assalini, and "neglect no wound." Dress wounds lightly; use but little grease, or bundle it up in charpie; apply dry or wet lint in cold water; if that is disagreeable, use the water tepid or warm. If you are called, and you find the wound filled with salves, etc., wash all off clean; let the wound lie open until it shines like varnish, from the exudation of true plasma; then apply the water-dressing.

When there are no foreign bodies present, you should always endeavor to unite wounds by immediate or mediate union; by so doing, you save your patient time, pain, and deformity. If the wound contains a foreign body, wash out the wound clean, and rather induce suppuration, that the pus may wash it out, for, if you close it too soon, the dirt, glass, wood, shell, or cloth, will cause the cicatrix to remain tender, and suppuration comes, long after, to discharge the foreign body; wounds are divided into different classes, and first of these are—

Incised Wounds.—They are solutions of continuity made by sharp-cutting instruments, which make a smooth cut, and hemorrhage is the great danger to be guarded against. The direction of the cutting-instrument is important. In large wounds of the thigh, if the cut be across the limb, the wound will gap. This gaping of wounds depends upon a variety of causes; in this instance it depends upon muscular contraction, hence, in your treatment, pay attention to position. In the case of superficial wounds of the skin, it is the organic contractility of the part which makes it gap.

There is apt to be a great amount of blood escaping from a fresh incised wound, which depends upon the kind and size of the vessel involved; if it is arterial, it escapes in jets, which you can count. There is no steady stream, and the blood is of a bright red hue. If it is of a mixed character, arterial and venous, the jets have a purplish hue.

If there is a profuse bleeding from a great number of small vessels, and you cannot distinguish the kind, from which it escapes, ligate the limb between the wound and heart with the tourniquet or handkerchief, and twisted stick. If it be arterial, it will cease; if it be venous, oozing will still continue. Apply ligature to arteries, and employ compression with styptics to veins.

In the treatment of incised wounds in the skin

apply adhesive strips, supported by compress and bandage.

The amount of blood lost will depend upon the character of the wound in the artery. A transverse cut of an artery bleeds but little; a round one, made by a puncturing instrument or an oblique or longitudinal one, will bleed much more freely. In the first, contraction and retraction prevents the bleeding, hence, inquire into the history of the case, and know the instrument with which the wound was inflicted, this will give you the key for your action. If it is a stab, there is no time to be lost. Incised wounds are accompanied with great pain, and pain produces restlessness, which induces nervous irritation and fever, and fever causes suppuration, hence allay this by narcotics.

Hemorrhage from Wounds.—Arrest the bleeding; that done, you have time to reflect. What is next to be done? Nature does it in some cases; if she does not, the surgeon must do it for her. In extensive wounds the patient often bleeds until fainting upon the battle field, and this is the basis of our treatment in internal hemorrhage, arising from wounds of the stomach, lungs, or intestines; prevent reaction from taking place too soon by keeping the patient in an upright position, so as to aid nature. When an artery is cut across it contracts, and thus diminishes its calibre, then it retracts or shortens itself, and becomes lost in its sheath, the syncope makes the circulation slower, and a clot forms at the divided end, and blocks up the artery. There is an external clot which forms between the artery and its sheath, and an internal clot forms in the calibre of the vessel. These clots become organized in time, and become absorbed, if a small vessel. If it is a large one, it remains for life a fibrous cord. The small vessel is absorbed to the first anastomosing branch, as the current of blood washes it off above. This is important to know, as you should never ligate near an anastomosing branch, for when the ligature comes away, the blood from behind will wash out the clot, and secondary hemorrhage comes on, because the clot was feeble, being so near a branching artery.

To stop bleeding from a wounded, temporal artery, cut it across that it may contract. In nine out of ten cases no clot will form unless you do so. In round or oblique, or longitudinal incisions, the patient dies from false aneurism or false exhausting hemorrhage.

If a soldier be shot and the ball has passed

through the lungs, he falls, becomes almost pulseless, and no blood escapes from the external wound. Look carefully to him, as he is bleeding internally. Lift him up that he may faint; the circulation ceases a moment or so. Nature takes advantage of this cessation, and a clot forms and blocks up the vessels, which also contract. If, however, he is a vigorous, powerful man, and lifting him in the upright posture fail to make him faint, bleed him from both arms until he does.

Afterwards be in no hurry to induce reaction. It will do him no harm to let him remain four or five minutes; if, however, he does not resuscitate, then dash cold water in his face, employ dry friction to the skin or mustard cataplasm, and give him fresh air. After treatment, place him in a cool, dark room, so that the secretions will readily pass out of the wound, which dress lightly; keep him very still. Give him but little fluid, employ tincture veratrum viride or digitalis, with opiates, to keep down the force of the circulation. If high fever come on, bleed him, and give him arterial sedatives, with small doses of calomel, and tartar emetic.

When all these means fail, in hospitals and armies they have an instrument to produce hemostasis in the French army. It has been found useful in internal hemorrhage and apoplexy of the lungs or heart. It is a copper air-pump with an India rubber receiver. The receiver is bound on the leg and a vacuum by means of the piston is formed. The blood rushes into the limb, and it swells in two or three minutes to fill the vacuum. Thus a powerful revulsion is produced from the bleeding part. It was invented by a Frenchman, and is employed in the French hospitals.

When the vessel is accessible, in wounds of cavities or extremities, we have certain mechanical means to arrest the hemorrhage.

Means of Arresting Hemorrhage in Wounds, etc.
—The best means is the *ligature* which was brought into use by the distinguished French surgeon Ambrose Paré; previous to his valuable application, surgeons employed the actual cautery, styptics of various kinds, boiling pitch, and, in amputations, they seared the arteries with a red-hot knife.

It is very necessary that the young military surgeon should fully understand how the ligature acts; many who come before our examining boards are found deficient on this subject.

In applying a ligature, properly, to an artery it should divide the internal and middle coats, the external coat is left intact; to do this, brace the thumb, after tying the surgeon's-knot around the artery, by drawing the thread until you feel the artery yielding under the ligature, draw steadily, never jerk; to cut them in this way, you must have a sound body; if the artery is diseased do not cut the coats, but merely compress them. By the surgeon's-knot I mean the simple one repeated before making the first traction. After this has been carefully done, cut off one end of the ligature, and leave the other long enough to hang out of the wound; never cut off a ligature close, unless it is to be passed into a cavity. You need not fear that your traction will divide the external coat, as it is not divided unless great force is employed, as it is composed of areolar tissue. After the internal coats are divided, plasma is exuded, which becomes organized, and unites the walls of the vessel. If, however, you fail to divide the internal and middle coats, no lymph is thrown out, and secondary hemorrhage is liable to recur.

The application of a ligature on a vein does not operate in the same way; the middle coats offer no resistance to the ligature; it is simply puckered up, not divided; no lymph is therefore thrown out. Inflammation arises and courses its way along the vein, and soon destroys life by phlebitis.

In the artery, a clot forms above and below the ligature; this adheres to the sides of the vessel, which is ultimately formed into a fibrous cord or entirely absorbed. If, however, the ligature is placed too near an anastomosing vessel, secondary hemorrhage comes on when the ligature comes away. In some constitutions no clot will form above the ligature, it only stagnates, and when the ligature comes away, the blood from behind forces this out of the vessel, and bleeding comes on. In all scrofulous and syphilitic constitutions, watch them constantly until the period for secondary hemorrhage has passed. In large arteries it will be three weeks, in small ones from seven to ten days. The ligature comes away with the loop as it was tied; it cuts its way by absorption, ulceration, sloughing, or mere softening of the part in the loop.

The best article for ligature is good saddler's-silk; it must be white, as all colored kinds are rotten. Lead wire is too weak; silver wire is better, and during a recent visit to Europe I witnessed the use of iron wire, which was very

highly recommended by my friend, Dr. Simpson, of Edinburgh.

Your silk should be carefully waxed so that it shall not slip; the silver wire should be very fine and wound upon a spool. In tying vessels upon a free surface, as in amputations, use the artery forceps of Liston; the bull-dog forceps are the best, with it you can seize the vessel, and a spring fastens the grasp; if you have a good assistant you can use a tenaculum or ordinary forceps; if you employ the tenaculum see that it is long, curved, and perfectly rounded, if they have sharp edges they will cut-out. If the vessel is large, hook the tenaculum into the orifice, but if small, pass it through and through the vessel; if very small, hook the vessel and tissue around it, but never tie the ligature till you see the point of the tenaculum on the opposite side of the vessel, and you can get your ligature below it. Young surgeons are often deficient in this department.

When the artery is sound draw it out from the surrounding tissue, and be very careful you include no nerve in the ligature, for if you do, spasms, pain, neuralgia, and even convulsions, may come on; if you include a vein, phlebitis will arise, and if a tendon, or a portion of a tendon, it will take months before coming away; it will also prevent complete division of the coats of the artery. Use always a small ligature, and tie with a single knot repeated. In very small and delicate *wounds upon the face*, use a small fine flax ligature, well waxed, or fine silver wire.

If you have a *cut in the palm of the hand*, it is folly to cut down and attempt to secure the bleeding orifices, you will cut more vessels than you can tie. Compress the radial artery, and if that stops the bleeding, cut down and tie it; if not, compress the ulnar artery, if that stops it tie it, or, in some cases, you have to tie them both. This same law applies to *wounds in the foot*; the contraction and retraction of arteries here is so great you cannot get at them. No gangrene will come on in either case.

Torsion of Arteries.—Seize the artery with an ordinary pair of forceps and twist it, the internal and muscular coats are lacerated, the vessel is twisted into a knot, say three or four times, not more, else it will be twisted off. This method must never be used on large arteries. There are two other methods, but I would not recommend them to you, called "*Machure*" and "*Ré foulment*." The first is to mash the artery, and the second break or mash the artery, and

push the mashed part into the calibre of the sound part. Easy to perform in large arteries, but the blood will drive out the plug.

In all large vessels of continuity and continuity, rely on the ligature, and always tie both ends when a large artery is divided. If you do not, regurgiant hemorrhage may occur in ten or fifteen minutes.

Compression in Hemorrhage from Wounds.—Next to the ligature for arresting hemorrhage, we have compression. It is of two kinds—temporary and permanent. In wounds of the extremities, tie a handkerchief around, as before recommended, and, when nothing better is at hand, twist this to tighten it, and it makes the Spanish windlass. This is temporary. The best tourniquet is *Petit's*. Dr. Physick said you might as well try to improve the Bible as it. When you purchase, see that the web is firm and inelastic; if not, it will give you trouble. Also see that the tongue of the buckle is round—not square, as square ones will cut out of the strongest webbing. These are but little matters, but of mighty importance. Before application, see that the two plates are in contact; if they are not, you cannot tighten them. This is the best instrument for temporary compression.

Charière, of Paris, invented one having one pad above and one below, with lateral metallic bands. This form will arrest the main arterial circulation, and permits lateral venous to go on. This form is very useful when operating in a case of hemorrhagic diathesis. Permanent compression is employed in penetrating wounds, capillary oozing, etc., made of a roll of simple muslin, as hard as wood; in superficial wounds, they are kept in place by the hands of an assistant or a roller bandage. If they are deep-seated, cover the surface of the compress with layers of collodion; this is employed to control bleeding, until suppurative discharge takes place. Compressed sponge is sometimes used; it is made by compressing under-screws or weights; when wet, in the wound, it soaks up the serum, dilates, and makes compression. When it remains too long, granulations shoot into it, which are torn off when the sponge is taken away. Do not confound this with sponge-tent; the latter is sponge soaked in wax. When you wish to exercise uniform compression on a limb or its main trunk, use a common roller, from the toe or finger up the extremities; never make your bandage of linen—it will slip; nor of flannel, as it is too

elastic; use washed muslin having no seams, and roll it into a firm cylinder.

Epistaxis.—Plug the nostrils with cotton or lint soaked in alum or powdered galls—the blood collects, coagulates, and compresses the bleeding vessels. If the blood flow behind into the pharynx, remove the anterior plug, introduce *Belloques sound*, and plug the posterior nares; if this instrument is not at hand, a flexible bougie, with the ligature, can be carried into the mouth, and a second ligature and plug of cotton or lint can be drawn up into the posterior nares and attached to a cross-piece outside the nose, until all hemorrhage ceases. Another method: the plug should be a piece of sponge or lint rolled up tolerably hard, a little larger than the end of the thumb, to the middle of this, tie a piece of cord, so as to leave two ends each about ten inches long. This is to be passed through the eye of a common silver probe or catheter, and carried back cautiously along the floor of the nostril until it appears at the back of the mouth. Take a long pair of forceps and bring the cord out at the mouth; withdraw the probe from the nostril, so as to leave one end of the thread hanging from the nose, and the other from the mouth; to this attach both ends of the cord connected with the plug; and then, by pulling the end of the thread at the nostril, the plug is carried backward into the throat, and afterward against the posterior aperture of the nostril.

The two ends of the cord, now hanging from the anterior aperture, are to be separated and tied firmly over a plug of similar material applied there.

There are a few useful styptics, as the solution of per salts of iron, matico, galls in powder. In wounds of the foot and hand, or sloughing wounds, where small vessels permit blood to escape, common resin in powder acts like magic.

Cauteries are also useful in arresting hemorrhage; they are of two kinds, actual and potential. The actual are of metal—iron principally; they are of different shapes, to suit the place to which they are applied. A key, with the ward knocked off, will answer. They should be heated to whiteness. It will then destroy the part, and does not adhere. Less hot than that, it will stick and bring away the tissue with it.

Potential cauteries have a chemical action. Caustic potash, nitrate of silver, nitric, sul-

phuric and hydrochloric acids, are the most important of this class.

In trephining compound fractures of bone or sabre-cuts, when an artery bleeds in the bone, it must be plugged. It cannot be drawn out and tied; let the plug remain four or five days; tie also a silk ligature at the end of the plug with which to draw it out. Unless you do this, it will be necessary to reopen the wound. Velpeau and Simpson have suggested and put in practice the use of needles, to act as ligatures in amputation, etc.; and, in some instances, they have been found useful. Velpeau proposes sending a galvanic charge through them. Such things may be talked of, but on the field cannot be relied upon.

The Second Intention after Arresting the Bleeding of Wounds is to Remove Foreign Bodies.—A clot of blood is a foreign body, and should be taken away. Pieces of wood, glass, metal, “stone,” and dirt or dust are often lodged, also leaden and other bullets which we shall treat of more at length under gun-shot wounds. Place the wound over a basin, and with a sponge wet with water held over, direct on it a continuous stream, or charge a syringe with water, and use it to remove the particles; this latter is very useful when the foreign matters are in a cavity. If they do not come away in this manner, do not attempt to scrape them off with the sponge, let the suppuration convey them away. The foreign bodies removed, approximate the edges of the wound, do this as accurately as possible, as I stated before always attend to position. If it be the abdominal muscles, flex back by pillows under the pelvis and shoulders. Certain agents are used to aid position, the first and most important is the

Suture.—The old surgeons had a vast number. Modern surgery has simplified this paraphernalia, and reduced the number from forty to four.

1st. Interrupted; use a common curved needle or darning needle with a single thread. Pass this single needle directly across the wound into both edges at once, thus you make a common stitch. If the tissue yields, pass it in on one side, and re-introduce on the opposite side. Always make a calculation as to the number of stitches wanted. In a wound, for instance, of three inches, use two sutures, or one in every inch. In tying, take off the needle, make a single or surgeon's knot on one side of the wound. If it is in the centre, it irritates as a

foreign body lying on the edge of the wound. Do not remove them till they loosen by suppuration.

2. *The twisted suture*; or figure of eight, use the insect pin for operations upon the face, pass the pin through both lips of the wound, then carry a thread under, across, and over it like the figure 8; not carried in a circle under it, if you do, it will make the centre bulge, and produce a tumor. In the other method, it compresses the centre. This suture is also used in all superficial wounds of dependent parts, a common needle with a head dipped in wax will answer. Silver pins are not so good; always oil the steel or iron pins before introduction.

3. *Glover's suture*.—This is used in wounds of the intestines. Approximate their edges, and with a fine cambric needle sew them over and over. It is the same stitch used by glove makers, and called by seamstresses over-stitch.

4. *Quill suture*.—Take the barrels of two quills or two small wax bougies of the same size, and two curved needles, thread the needles with a double thread, let one end be whole, so as to make a loop. Pass the needles through and through, and thus leave the loop on one side. You may use two or three sutures of this kind; place one of the bougies in the loops, laying the other bougie parallel to it on the other side of the wound. Tie the open ends of the threads over it after cutting off the needles, with this you may compress as long as you please, even ten or twelve days without trouble, and they will not cut out; some recommend dry sutures; this is nothing more than a dry bandage, and the four sutures above mentioned, instead of bougies or plates of lead will answer.

Scalp Wounds.—Avoid stretching a wounded scalp, as erysipelatos inflammation is induced by it, as the part is prone to such attacks. The parts must come together, and if stitches are to be employed, use the silver wire. There are, however, exceptions to this rule in civil practice, for in Guy's Hospital the "scalp-wounds are treated by sutures, strapping pads of lint, or warm water dressing, hemorrhage is to be checked by the application of the ligature to the bleeding vessels, cold water and pressure. If erysipelas follows, it is to be treated with iron (tinctura ferri sesqui chloridi) and stimulants, with the local application of flour.

Of 120 cases treated by this method all did well.

Caution.—The patient should live abstemi-

ously for a week or two after such an accident.

Wounds of the cheek, if not deep, can be treated by collodion, which is a solution of gun cotton in ether, the ether evaporates, leaving the cotton as a covering. Remember always to cork your bottle, or else the ether evaporates, leaving the cotton dry.

One-half of the adhesive plaster that is found in the shops is like Pindar's razors, made to sell, some of it will not stick, others irritate the surface they are applied to. Buy, therefore, only that which is good, see that it is kept in a tin case, if it is old it will dry and crumble, and will not adhere. In its application, shave off all hair, and wipe the parts dry. In warming your plaster, do not do it before a fire, you will burn it. Fill a tin or bottle with hot water, or heat it on a flat iron, always apply the side around the bottle which has no plaster on it, in this way it is warmed uniformly and not burned. To prevent irritation arising from the ordinary adhesive plaster, the late Dr. Liston introduced the gum cloth or isinglass plaster. It is made by dissolving gum or isinglass in alcohol, and dipping muslin in it, which is left to evaporate. This requires simply moistening with water before application.

Gutta percha cloth has lately been introduced; it is fibrous, strong in one direction, but tearing easily in another, like wet paper. This may be employed in dressing wounds by occlusion.

Another kind is called gum elastic cloth, but this heats the parts and induces suppuration.

These strappings are to be aided by rollers and splints. After the wound is brought together, apply what is called top-dressing, its object being to exclude air, which is poisonous to all wounds. Water, cold, warm, tepid, or hot, is what we prefer. Others smear lint or linen with cerate. The lint is of two kinds, patent and scraped. See that it has no lumps, and is perfectly smooth and clean, else it will irritate a tender cicatrix. The wound also requires a cover over this dressing to prevent evaporation, oil silk or gutta percha cloth. If you have neither of these, use silk, or even muslin dipped in oil and wax, but be very careful not to heat your wounds by too heavy dressings. Keep them cool, if you wish them to heal by the first intention, or warm, if suppuration is desired. The last kind is sought for in lacerated wounds, or when foreign bodies exist.

After Treatment of Wounds.—We must prevent inflammation, chiefly by anti-phlogistic remedies, but be cautious here. In Dr. Physick's time it was the practice to bleed, starve, and purge the patient after all large and severe wounds, injuries or operations. But unless the patient is plethoric, or has pain, and above all fever, eschew this practice. If carried to excess it will prevent union, as no plasma will be effused upon the cut surface. My usual treatment is to put the patient on a low diet, occasionally a purgative and the following mixture :

R.	Mistura neutralis,	℥ij.
	Antimonii et potassæ,	gr. ij.
	Morphia acētatis,	gr. i.
	Spts. nitrosi dulcis,	℥ss.
f. m.	P. sacch. alb.	- ℥ii.

Dose.—A teaspoonful every hour while there is fever or pain.

Modify your treatment to suit each individual case.

In some cases the very reverse condition of matters will arise, and you must stimulate your patient, and give him large doses of opium. This is frequently the case in badly lacerated, contused, or complicated wounds. Always pay strict watch to the general condition of your patient, and never leave him, when in such a condition, without a faithful nurse or assistant.

The summary of treatment is :

First. Arrest the bleeding.

Second. Remove foreign bodies.

Third. Bring the edges together, and attend to position.

Fourth. Keep out the air and particles of dust floating in it.

Fifth. Attend to the general condition of the patient.

Gun-Shot Wounds.—In the order in which we have arranged the subject of wounds, those termed "punctured" and "lacerated" would follow "incised;" but, as both these forms are seen under the head of gun-shot, we shall thus treat them. By gun-shot wounds, we now comprehend all wounds received during the time of battle, made by the projection of hard bodies, the greater part of which are musket-balls.

The causes which produce such wounds, are bodies propelled by gun-powder from engines of an infinite variety of construction and names, which are destined to throw bombs, bullets, balls, or shot. All such bodies travel nearly as quick as light, and more rapidly than sound, so

that the shot is received before the explosion is heard.

Their direction is such that the diagonal drawn from the point of departure to the point of their fall, and the parabola which they describe, are so much the greater in proportion to the extent of space over which they travel. This is owing to two principal causes: first, on account of the resistance which the ball meets with on the part of the air; and secondly, on account of the earth's power of attraction. Rounded bodies, such as balls and bullets, at the end of their course revolve upon themselves, or, in other words, upon their axes, and can, for some time, keep themselves in their curvilinear motion.

The consequence of which is, that, as soon as they meet at this distance any body of equal form, they pass over its entire periphery, and, of course, must produce effects different from those which take place when they encounter it at the very onset of their career, and in their original direction. This subject is well understood by the scientific billiard player, and can, on the board, be beautifully illustrated.

Bombs and grenades are spherical bodies of iron, hollow inside, and filled with powder, or a mixture of gun-powder and other materials, the explosion of which bursts their parietes, reducing them to pieces, differing in shape and size, and presenting, most always, irregular cutting edges, with angles of more or less sharpness. The balls are of three kinds, either two and two, united by a bar of the same metal, or by a bar of iron, and are termed bar-shot. The grooved rifle and its hollow cylindro-conic ball are, at present, interesting all military nations, especially our own, owing to its preventing the rotation of the ball, and thus giving greater accuracy to the aim. It is of interest to surgeons, in consequence of the laceration produced by it upon the human body, as well as the injury it inflicts upon bones, splintering or sinking into them, frequently rendering amputation or resection necessary. Balls, also, are of different calibres, varying in weight from half a pound to five hundred pounds. The musket, rifle, and pistol balls are made of lead. The Mamelucks and the Arabians, according to the observations of Larrey, force an iron wire of more or less thickness through them, which converts them into chain-shot, or they leave attached to them the pedicle which they have acquired in the bullet-mould; they also combine with their lead, stones, iron, and copper, in order to render these bullets more destructive.

There are likewise wad and powder wounds, the ball or bullet driving before it into the body, pieces of clothes, leather, money, wad, &c. Gun-shot wounds are characterized by nervous perturbation. It will be found that the bravest man when hit by a ball or bullet will sometimes run like a boy, or weep like a child; this is nervous excitement which they cannot control. It is stated that Gen. Scott, when wounded at Lundy's Lane, wept, but still he was brave enough to take Vera Cruz. Another form of this nervous excitement will be seen when rank after rank will leave the battalion to relieve nature of an excessive secretion. This is also the case in duels.

Appearance of Gun-shot Wounds.—This will depend upon the shape, velocity, distance, &c., of the missile, and the position and situation of the part wounded. The wound of entrance is a confused one; its edges are inverted, and surrounded with a blue areola, this blueness arising from the congestion of superficial capillaries. In some cases, when the weapon is near, the powder is driven into the wound, and produces a stain. This, as a medico-legal matter, is important, as by it we can tell sometimes where the person was standing when shot.

The wound of exit is a lacerated one, having its edges everted and torn. The difference in the form of the wound is explained by a law in physics; bodies passing from a rarer medium (the air) into a denser (the body) push it before it, or from a denser into a rarer, break the parts before them, therefore, by the kind of wound, we can determine the direction of the ball.

Of the Pain of Gun-shot Wounds.—Some of the books on military surgery affirm that gun-shot wounds produce no pain. Guthrie says they are intensely painful. In one instance, in a case of wound in the abdomen, it required sixteen grains of opium to relieve the pain; in another instance of a shot through the muscle, in which no large vessel or nerve was torn, there was but little pain. If, however, nervous cords are torn, tendons or aponeurosis lacerated, or pulled from their attachments, or the ball or bullet pierces the bone, such gun-shot wounds cannot fail to cause a great amount of pain and agony.

Hæmorrhage in Gun-shot Wounds.—Bleeding in gun-shot wounds is usually slight, but they are apt to be complicated by ecchymosis or an in-

filtration or effusion of bloody fluid into the cellular tissue; this takes place in consequence of the rupture of a blood-vessel, chiefly venous, more or less deeply situated. The simple enlargement of the wound will sometimes remove this, or the application of scarified cups, if there is no wound or solution of continuity. If, however, a large vessel be wounded, blood, as before stated, will well out with each pulsation of the heart; the wound, in such a case, must be enlarged, so as to lay bare the arteries and apply the ligatures; if there is much retracted, include the cellular tissue, and even the muscular fibre, but, if possible, draw the artery out by the forceps or tenaculum, and then apply the ligature. This latter, if practicable, should always be preferred, but never let your patient bleed to death because you cannot get the artery free.

To find the Direction of Gun-shot Wounds.—Place the parts as nearly in the same position as when the wound was inflicted. You may have obtained the wound of entrance, and also of exit, and still the ball may remain in the body, this is done by the ball splitting in two pieces, one remaining by coming in contact with cartilage, bone, &c., while the other part passed out. There may be but the wound of entrance, and no foreign body in the wound; for instance, a ball strikes against the cartilages of the ribs, imbeds or indents them, but their resiliency forces it out again.

When bullets are driven with force, and strike the human body in their original direction at no great distance from the point of their departure, they perforate, lacerate, and even carry the parts off entirely. If, on the contrary, they are near the termination of their career, or are spent, they revolve upon themselves without changing the elastic or membranous coverings which yield to their impulse, while the subjacent compact or fragile parts are ruptured, lacerated, or broken. To these circumstances is due the fact of many sudden deaths, which were in olden times attributed to the pressure of air displaced and agitated by the ball, (called the wind of the ball.)

If the ball is of large calibre, it will carry away, and unequally cut off the limb. If the ball is small, and strikes only the fleshy part, it will pass through it; if large, this alone is torn off, leaving the bones denuded. As soon, however, as it meets with any obstacle in its way, the ball changes its form and direction, and makes several turnways and windings, and

becomes lodged in either the most elevated or the most oblique part of the limb.

Treatment of Gun-shot Wounds.—The first thing to be attended to, is the constitutional treatment, to allay the nervous prostration and perurbation by warm wine and water, aromatic spirits of ammonia or brandy. The next rule according to Larrey, is “commencing with the dressing of the most simple and least important injury, to proceed with that of a more serious one, and so in succession to the most important, more particularly if this should require a painful-operation. The reasons for this method of proceeding is that if a beginning were made with the last wound, the patient might be seized with syncope after the operation, which would render it necessary to postpone the dressing of the other wounds; or perhaps, frightened and fatigued by the greater or lesser intensity of the pain, he might decline any further assistance; whilst on the other hand, the cares bestowed upon the more trifling wounds being less painful, and encouraged by it, has not near so much to dread the treatment of the more serious ones.”

Where no foreign bodies are to be removed, the dressing of the gun-shot wound requires a simple slightly tonic and compressive treatment. To accomplish which, a linen rag or piece of patent lint with holes in it, is soaked in camphorated water, or sweet oil, or even in salt water, in which there is a small portion of the solution of the acetate of lead, with or without a solution of opium. This should be immediately applied, and the parts secured by compress and roller, taking care that the pressure of the bandage employed be uniform.

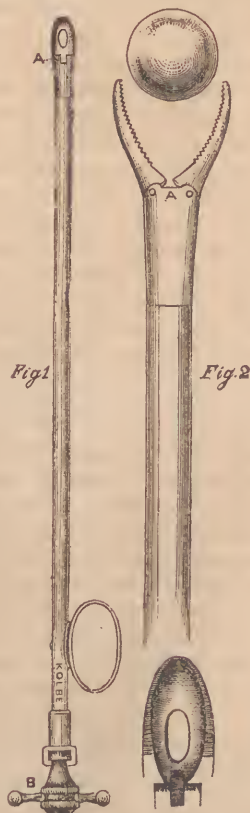
Of Foreign Bodies.—These are chiefly bullets, slugs, pieces of iron, copper, coin, wood, bone, stones, dirt, etc. In many of the wounded of the British soldiers, the writer noticed the pieces of the red cloth carried before the ball. Examine, therefore, each wound carefully, but do not probe unnecessarily. Introduce your finger—it is sensitive, and will tell you the nature of the body. If the wound is too small, use a silver or gold probe, with a little ball at the end of it; you can in this way gain some information by the sound communicated and the impression made. If the bone is bare, it will grate upon it; if a ball, you can feel its rounded form, but you cannot distinguish cloth from flesh, unless you use your finger; if an important vessel is exposed, the finger will de-

tect the pulsation—*this is of importance.* The ordinary gun-shot probe is twelve inches long, with a light ball on the end of it; but you must have more than one, and of different lengths and thickness. Ascertain the condition of the body, whether it be fixed in bone or loose.

The Method of Removal of Foreign Bodies.—If it is a small ball, use small forceps—the smaller the better, placing the wound in the same position as when it was inflicted, so that no pieces of muscle may obstruct the probe or forceps.

In large wounds, use larger forceps—see that your forceps have sharp teeth, or are serrated, so as to be able to seize the bullet, and hold it firmly. Piercy’s bullet forceps were formerly employed in the French army—now they are thrown aside. Instead of which we now use a modification of the instrument of Le Roy D’Eti-oles.

The bullet-extractor (figs. 1 and 2) has considerable advantages over all bullet-forceps, being delicate and yet more powerful.



The lever-power is brought in close contact with the foreign body, as seen by letter A, fig. 2:

while in the ordinary bullet-forceps (fig. 3 and 4) the maker is obliged to put the joint in the middle of the forceps to keep it of uniform thickness, and this diminishes greatly the strength of the forceps; therefore it is apt to slip.

The bullet-extractor (fig. 1) consists of a metallic tube ten to twelve inches long, and three to four-sixteenths of an inch in diameter, with two spoon-shaped levers connected with hinges to the tube, and also to a steel rod at the opposite end; the handle is seen in fig. 1, letter B; by half a turn it expands or closes, as seen in letter A at the bottom. In fig. 2 is seen, on a large scale, the half-spoon arrangement, from the inside, and balls of from one-sixteenth to three-quarters of an inch can be grasped firmly with this extractor. As there is no obstruction from a joint, it can be introduced into deep-seated wounds, made by the conical ball, and can be readily opened when near the ball, which is grasped, as in fig. 2, letter A; when, by twisting the handle, B, fig. 1, the operator has perfect control over the instrument.

Fig. 3.

Fig. 4.



If the bullet is lodged in bone, use a trephine.

and remove a portion of the bone with it; but if very deeply lodged, let it alone. If the ball has passed around the limb or the body, and lodged at a point opposite the place of entrance and is superficial, cut it out by making a new opening. This is often the best plan: but do not give your patient a great deal of pain by hunting in the dark, if you cannot feel it with your finger or probe. The part opposite to where the bullet lies is apt to be purple in appearance; feel there for it, and, if you detect it, make the part tense over it, and cut down upon it; get, then, the point of the knife under, and turn it out. Often times a round bullet is found flattened into a slug, making the wound of exit like that of a stab. If you are unable to remove the bullet, and it is of lead, and round, it becomes encysted, and may remain for years, and in some instances for life. Rough ones, of iron, copper, etc., are apt to cause sinuses. These bodies must be cut down upon and removed, if loose; if tight, let alone, introducing them lint into the wound that it may suppurate and be discharged. Put on light dressings, as I stated before; cold water for the extremities, mixed with a little lead water, and warm water for the trunk. Such contused wounds sometimes heal by the first intention; but your work is not done yet, inflammatory fever or constitutional irritation may arise; watch your patient therefore, for ten or twelve days, or until detachment of the slough; this takes place at the wound of entrance.

An artery merely brushed by a ball may give way, and profuse hemorrhage ensues. This is the period of greatest danger; therefore always be prepared for secondary hemorrhage; look carefully to the direction the pus takes, and prevent its forming pouches. Regard also the sinking into hectic, that may occur as a result of profuse suppuration; support and strengthen the system.

There are two complications in gun-shot wounds that need the most careful watching; attend, therefore, strictly to them.

The first is acute inflammation, indicated by the edges of the wound becoming everted, red, and shining; look carefully to it, or else the patient will lose his limb, or perhaps his life. Resort to most active local and constitutional antiphlogistic treatment.

The second complication is excessive swelling of the part caused by the effusion of serum or blood, which is apt to be followed by erysipelas or hospital gangrene.

Larrey found the most useful application was the actual cautery, applied to the reddest spots of the erysipelas, and to those which are nearest the wound; the incandescence of iron arrests its progress, and its application gives but little pain. He also recommends for the gastro-intestinal affection the exhibition of one grain of tartar emetic, dissolved in cold and strained infusion of ipecacuanha. This treatment should be followed up by administration of large doses of bark, or rather the sulphate of quinine, combined with camphor and opium, and by an acidulated drink, made with the hydrochloric acid. The same treatment is to be employed in hospital gangrene—removing the putrescent matter and odor by a solution of chloride of sodium.

Powder and Small Shot Wounds.—When you find the parts specked, the shot has come from a distance, and sinks but a little way below the skin. If the body has been near the shot, they enter as a solid, they are scattered through the tissues. In this manner they may lacerate internal parts, and cause intense inflammation. Sometimes these small bodies enter cavities, and cause death by wounding important organs. A case occurred on Long Island: a young man was playing with some children, who had a small pocket cannon—a small shot from which entered his heart, and caused immediate death. In like manner they may enter the brain through the eye. In such cases no mark of its entrance is left behind—not even a cleft in the cornea, after four to six hours. When a whole charge enters the body, do not pick them out, but apply warm water dressing. If a scattered charge is received on an unexposed part, as the abdomen or breast, let them alone; but if on the face, pick out every one. This is done by making a slight cut, and then turning them out with the point of the knife; then applying the water dressing. When powder is driven into the parts, they are also usually burnt by the gas. If on the face, apply fine carded cotton, or, still better, lint, with chalk in powder, or even flour; or, when these are not at hand, sweet-oil, with a solution of opium. After the irritation is removed, pick the powder out. A small needle is the best instrument for this purpose. If very extensive, a blister will remove the grains—the serum washing them away.

In my next communication, I shall treat of the “fractures of bones occurring as a complication in gun-shot injuries.”

GUN-SHOT WOUNDS COMPLICATED BY FRACTURES OF BONES.

These injuries and fractures have many peculiarities in their nature and course, by which they are distinguished from the ordinary complicated fractures as seen by the civil surgeon.

I shall, therefore, depend almost entirely upon the army surgeon, and principally upon the distinguished “Surgeon-in-Chief of the Schleswig-Holstein army,” who made careful observations upon two thousand cases in the campaign of 1849 against the Danes.*

“The most fearful injuries of bones are those caused by the heavier projectiles; cannon-balls, pieces of bombs, fragments of wood or of other material which, torn loose and scattered around, cause comminuted fractures of the bones, and in the soft parts a concussion which diminishes their vitality, so that the blood stagnates in the crushed vessels, and the innervation being in a decreased extent, gangrene commences. Very frequently these injuries are fatal from the shock experienced by the nervous system, showing itself by an extreme degree of weakness, coldness and pallor, and by a rapid small pulse; often death occurs in the first twenty-four hours; should the patient live longer gangrene sets in, which generally attacks all parts below the affected spot, and now the patient rarely survives the fourth day, remaining in a depressed condition with a more rapid, but by no means strongly developed pulse. This mode of death occurs most frequently in those persons where a heavy projectile has torn away a whole limb; often they die soon after the reception of the injury, many indeed upon the field of battle; the least dangerous is the loss of an arm; and again in such cases the danger is increased the nearer the injury is to the trunk. Of four cases only one recovered where the arm was torn away in the elbow-joint; the three others—where the injury took place above the insertion of the deltoid—were fatal; in one of them exarticulation was performed at the shoulder, and proved fatal within the first three days.

A fifth case, in which the arm was torn away above the elbow by a cannon ball, and in which amputation was soon after performed, proved fatal on account of rupture of the spleen, with fracture of the ribs and injury of the lung, caused by the arm being violently

* From the *Hand-Book of Surgery* of Dr. Louis Stromeyer, translated by S. F. Statham, London, 1860. (Abridged.)

struck against the side; the patient lived to the eighth day.

A similar case ended fatally after complete healing of the stump, with symptoms of supuration of the kidneys, their rupture having been indicated in the first instance by obstinate vomiting, ice-coldness of the extremities and hæmaturia. In these fatal cases after the arm has been carried away, the simultaneous injury to the trunk must be always taken into consideration, the risk of this is less in similar accidents in the lower extremities; while there, as well known, the danger of amputation is greater."

Not less dangerous than the cases last mentioned are those where the bone is crushed by a heavy projectile, yet the soft parts are preserved; these are very apt to result in mortification. The appearance of the limb deceives the young surgeon as to the extent of the injury, so that it is supposed a simple fracture is present, yet upon closer examination extensive crushing is discovered. The extent of the injury is recognized by the peculiar feeling of many fragments of bone rubbing upon one another by the increased mobility, and by the introduction of the finger, if a wound is present.

GUN-SHOT WOUNDS OF SINGLE BONES.

Injuries of the Facial Bones.—It is remarkable what slight accidents follow these injuries. Dr. Stromeyer states that he has seen many cases where a bullet had traversed the root of the nose, or somewhat deeper beneath it, without the slightest symptom of concussion of the brain showing itself, as is otherwise frequent in fractures of the nasal bones; these wounds healed rapidly, and without extensive exfoliation. The wounds are considered by him just as trifling where the bullet entering the upper jaw of one side traverses it and the nasal fossa, and escapes through the opposite cheek; both antra of Highmore being frequently opened. Still more frequent are cases where the bullet strikes upon and injures the upper maxillary bone anteriorly, and makes its exit in the neighborhood of the ear; in these cases a paralysis of the facial nerve is common on the injured side, fully disappearing after some months, so that we must probably refer it to a contusion of the nerve. Balls remaining in the antrum Highmorianum often give rise to no accidents.

GUN-SHOT INJURIES OF THE VERTEBRAL COLUMN.

Injuries of the Spinal Processes frequently occur without serious consequences.—In two cases, the cervical vertebræ were contused by a bullet, which had entered on the outer side of the sterno-mastoid, and had also bruised the brachial plexus; paralysis of the arm of the corresponding side was at first complete, but gradually sensation and motion returned almost fully. In one of the cases the phrenic nerve was contused, and for eight days there was great dyspnœa present, and the patient was obliged to remain in the sitting posture; it was at first supposed that the lung was injured, but there were no physical changes on the corresponding side of the chest. In a case of contusion of the cervical vertebræ by a similar shot there remained stiffness and pain of the neck on motion, after four months. In a more severe case where the posterior portion of the fifth and sixth cervical vertebræ were torn away by a bullet, paralysis of the lower extremities occurred on the first day, and soon after of the arms; and death occurred on the fifth day.

In another case, where a bullet entering laterally, had severely bruised the third and fourth cervical vertebræ, and had not been extracted, death followed by inflammation in the spinal chord and brain.

On the first of August Dr. Stromeyer extracted a bullet which had entered on the sixth of July, between the arches of the third and fourth lumbar vertebræ, and there had become fixed. At first there was no severe symptoms; suddenly, there occurred violent pains, with cramp in the extremities, resembling tetanus, and accompanied by delirium; on the removal of the bullet the finger could be introduced into the spinal canal, but the patient died; the autopsy showed inflammation of the spinal chord.

Gun-shot Injuries of the Lower Jaw.—These injuries occur very frequently, and are often of the most frightful form. In many cases the bullet had traversed each lateral half of the lower jaw, and on each side, causing comminuted fracture.

The treatment of such cases was extremely simple. Merely removing teeth or fragments of bone, which were either fully loose, or were hanging by thin shreds; the discharge of the rest was expected from the suppurative process, and they were only removed when this could be performed with ease.

The mouth must be cleansed by injections of

cold—later by lukewarm—water. This is considered positively essential, as the swallowing of matter leads not only to gastric irritation, but also to typhus symptoms. A solution of chloride of lime was also found at times useful in cleansing the mouth.

In no case was any resection undertaken of the injured jaw, nor any bandage applied. The result of this simple manner of treatment was very favorable, as not only the majority of the patients recovered, but the resulting deformities were but slight; the fragments united by bone, excepting in two cases. This, Dr. Stromeyer says, is due to the fact that he left the discharge of the greater fragments of bone to the suppurative process, and thus, the periosteum remaining behind, could form new bone.

Gun-shot Wounds of the Pelvis.—These injuries were always very dangerous, excepting those where the crest of the ilium was struck and shattered. All his cases ended fatally where the bullet penetrated the pelvis posteriorly. Dr. Stromeyer considers the antiphlogistic as the only proper treatment of these deep seated injuries of the pelvis; pain relieved by opium, and mercury given, should pyæmia arise.

Gun-shot Injuries of the Clavicle.—These injuries are not considered so dangerous as might have been expected on account of the neighborhood of important organs. They are met with in all forms: from simple fracture, where the bullet had glanced off, to the complete comminution of large portions of the continuity of the bone. In one case, both the acromial end of the clavicle and the spine of the scapula, were fractured. In the case of a lad who had received a musket-shot when in close proximity, the acromial end was fractured, and a piece of integument, of the size of the hand, was torn away. Yet this case was successful; the remainder of the clavicle, which had been drawn upward half an inch, and had projected very much, was again approximated to the shoulder during the process of cicatrization, and the cure resulted without deformity. The treatment of these cases was extremely simple; the arm was fastened to the trunk, cold applications at first employed, and oiled charpie after the full commencement of suppuration; the fragments of bone were only withdrawn when become fully loose.

Dr. Stromeyer considers that injuries of the clavicle are specially suitable for proving that expectant treatment, without surgical inter-

ference at first, is by far the most preferable, and that the early extraction of sequestra, or resection, is not necessary, unless under peculiar circumstances.

Dupuytren distinguishes in gun-shot injuries of bones, the primary, secondary, and tertiary splinters.

The primary are those found fully loose, and which are drawn out on the first examination; secondary, those still hanging to the soft parts and becoming free by suppuration—how soon these can be withdrawn depends upon their position; if superficial, their discharge may take place without any violence from the fifth day; if deep or very large, they may remain for many weeks.

Tertiary splinters are those which arise through inflammatory necrosis of the fractured ends. The larger these sequestra are, so much longer time is required. The most powerful means for obviating this inflammatory necrosis are rest, the antiphlogistic treatment, and the free escape of matter.

The required rest is to be obtained by suitable position and retention as in ordinary fractures, (except in rare cases,) nothing is more prejudicial during the first few days than the movement of the fractured limb.

The second capital point is the antiphlogistic treatment. A great man, John Hunter, says, in his "Treatise on Gun-shot Wounds," that injuries of the extremities do not bear venesection as well as those of the cavities, and the majority of surgeons follow this doctrine; but Dr. Stromeyer considers it erroneous, and he employs venesection in complicated cases with the best results.

He also states that, from all he has seen in the campaign of 1849, he is well able to hold the same opinion as regards gun-shot fractures. Unfortunately, he observes, that in these days the value of venesection, as well as of the most active remedies, is sunk through the influence of the present expectant, homœopathic and hydropathic systems, so that the young German surgeons glory in the fact that they have never ordered a blood-letting. The proper time he states for venesection, is within the first three days from the time that the patient completely recovers from the first shock. When once suppuration is present, it is no longer indicated; but now the local abstraction of blood by leeches, and in many cases by incision—cold applications, as before recommended—are con-

sidered by him as next in importance to abstraction of blood as an antiphlogistic means.

Gun-shot Injuries of the Scapula.—The injuries of the shoulder-blade arise not only from bullets piercing from the side, or from behind, but also very frequently from such as penetrating the pectoralis major from before, reach the axilla, and strike the bone from within outwards. In one instance, Dr. Stromeyer observed an injury of the inferior angle of the scapula from a bullet, which, entering on the inner side of the arm close above the elbow, had coursed along the vessels, and again become free between the scapula and vertebral column.

Fractures of the scapula are only very dangerous when the fissure extends into the shoulder-joint. In such cases, there does not follow, as might be expected, an acute inflammation of the joint, for it does not swell and is not painful on pressure, but the wound takes on a bad character, and pyæmia results.

The diagnosis of the fissure into the joint being difficult, even when it is known that the scapula is broken, all these cases must be treated antiphlogistically, and that very strictly.

Dr. Stromeyer's treatment is, perhaps, too strictly antiphlogistic for the notions of the followers of Todd in medicine, with Kern, Larrey, Guthrie, and our own distinguished surgeons, who depend on a full diet, with rest, and occasionally a mild purgative and cold water, as the local application.

GUN-SHOT INJURIES OF THE HUMERUS.

These are to be divided into injuries of the shaft and of the articulating ends; those of the shoulder-joint are not rare, occurring from the head of the humerus being struck by bullets from before, from outwards or from behind, and also from inwards, the last penetrating near the coracoid process, and traversing the axilla; the brachial vessels and nerves usually escape, but this is not always the case, as in the report of the surgeons in charge of the wounded at "Bull Run," it stated that of the wounded of the First Minnesota (at Richmond) Regiment, Company F, Sergeant Harris, a musket-ball passed through the left shoulder, which was followed by almost complete paralysis of the arm; while six cases of musket-balls through the shoulder are all stated to have recovered but one; which was fatal.* Bullets, according to Dr.

Stromeyer, grazing the shoulder-joint often traverse a portion of the deltoid without opening the joint. Whether the articulation is opened or not, cannot always be determined by an examination of the wound, but is ultimately determined in the course of the case by inflammation arising in the joint. He states that this uncertainty in the diagnosis is of no great importance, as in either case antiphlogistic treatment must be employed, and injury of the capsular ligament calls for no special treatment. With care, the cure takes place by ankylosis after long-continued suppuration; but should the last prove dangerous to life, resection of the head of the humerus is to be performed. Extensive comminution of the head of the humerus does not necessarily demand resection, as a cure can occur by ankylosis, after the fragments loosened by suppuration are discharged; as, however, with the help of resection, the mobility of the arm can be preserved, it is preferable to undertake this operation at once, or after suppuration has been fully established. Dr. Stromeyer states that those cases are the most difficult when the shoulder-joint has been injured internally and inferiorly by a bullet entering in the axilla. Everything here depends upon deciding, in the fresh state of the wound, as to the extent of injury to the bone. A case occurred where the medical man in attendance supposed that injury of the ribs existed, and where, on the autopsy, it was found that the anterior costa of the scapula was split off, including a portion of the glenoid cavity, and that the head of the humerus was grazed. In this case, hemorrhage took place about the twelfth day, the subclavian was taken up, the bleeding recurred, and the patient died. Had the piece of the scapula been removed in the first instance, after the resection of the shoulder-joint, the case would have probably proved favorable. Resection of the entire body of the scapula has been performed with success in this country and in Europe. One of the most complete and interesting cases, occurring in this country, is given in the *REPORTER* for Sept. 21, '61, by an ingenious and skillful surgeon, Dr. A. G. Walter, of Pittsburgh, Pa. Such cases are highly creditable to the humane and accomplished surgeons of the present century.

If resection of the humerus is performed in the ordinary way, by an incision between the two tubercles of the head, it is not difficult of execution—the long tendon of the biceps is readily drawn aside by means of a hook, and the ope-

* It is very gratifying to find our enemies testifying to the devotion of our surgeons, by night and day, to the sick and wounded.

ration then proceeded with; but, after this operation, the secretion from the wound does not readily escape. Stromeyer, therefore, introduced a new method in which the articulation is opened posteriorly by a crescent-shaped incision, commencing beneath the acromion, and proceeding backwards and downwards. Thus the secretions escaped with facility as the patient lay, and the success fully justified the expectations. Burrowing of matter did not take place, and the patients overtook, in their recovery, others who had been operated on months previously. He, therefore, considers it proper to recommend this innovation urgently to the notice of surgeons.

Gun-shot Injuries of the Elbow-Joint.—Gun-shot wounds of the elbow-joint are considered, in general, more dangerous than those of the shoulder-joint. This opinion was held by Larrey, who writes, in his "Clinical Surgery," the "rending of the fibrous and nervous structures of this joint is serious, and always demands amputation of the limb. I know of no instance of a cure where this limb was seriously injured by a ball."* This same opinion was held by Guthrie in his work on Gun-shot Wounds of the Extremities: "Wounds of the elbow-joint by balls, even when only one of the bones forming it is injured, seldom result favorably; commonly they indicate, at a later period, the necessity of amputation, on account of destruction of the cartilage, after the hope of ankylosis of the joint has proved vain."

By the great number of failures to save the limb under these circumstances, I am thoroughly convinced that such cases are only rare exceptions in military practice. Yet, in certain particular cases, and under favorable conditions, this same surgeon recommends resection of this joint instead of amputations of the arm, yet he never undertook such an operation. It was reserved for "Langenbeek and Stromeyer" to introduce this important improvement into military surgery, for, according to the statement of Dr. Frederick Esmarch,† this operation was not performed previous to 1848–9, either in Paris, Italy, Baden, or Hungary.

The same authority observes, that "on comparing, statistically, the results of resection of the elbow-joint with those of amputation of

the arm, "it can no longer be doubted which of the two is preferable. Out of 54 cases of amputation of the arm 19 died; out of 40 resected at the elbow-joint only 6 died."

In the Crimea, 153 arms were amputated, and of these 29 died; 17 elbow-joints were excised, with 2 fatal cases. In all these we have 207 cases of amputation, with a mortality of 48, or about 23 per cent. Of the resections we have 57 cases, with 8 deaths, or 14 per cent. Thus, then, in comparing amputation of the upper part of the arm with resection of the elbow-joint, we obtain a per centage of 9 in favor of the latter operation.

According to the carefully prepared statistics of Dr. Heyfelder,* a distinguished surgeon of St. Petersburg, he states, concerning the resections of the upper extremities, we find 288 cases of resection of the elbow-joint, (32 deaths, 220 cures, 6 doubtful, 17 partially successful, and 13 failures.)

He has in this work brought together the whole of our present experience on resections collected from the literature of all countries, and altogether he has collected 2,662 resections which have been made, the results are known of 2,241 cases; there have been 452 deaths, and 1,616 complete cures; in 1,789 cases the life has been saved; 173 cases have been unsuccessful, and of 421 the result is not known.

The healing of the wound after resection of the elbow-joint is, indeed, usually more tedious than after amputation, but the patient retains his limb.

How much of the comminuted bone may be taken away, and in what extent of comminution it can be fairly attempted to preserve the limb by resection?

"Guthrie" would only resect, where the lower end of the humerus alone, or where the upper joint-ends of the ulna and radius are together injured.

"Bandens" is of the opinion that resection should only be performed where one alone of the three joint-ends is injured. Yet, in truth, neither of these authorities speak from experience, while "Esmarch" has performed this operation, where not only one or two, but all three bones of the elbow-joint have been injured. He has removed from their surrounding soft parts, four to five inches in length, both from the humerus, ulna and radius, when these portions had been struck by the bullets. In

* However, the father of French Surgery, Ambrose Pare, has recorded two excellent cases of healing after wounds of this kind.

† Esmarch on Resection of Gun-shot Injuries, p. 79. Kiel, Charl. Scroder & Co., 1851. Translated by S. F. Statham

* The Operative Proceeding in and Statistics of Resection, by Dr. Heyfelder. Wien, 1861.

another case, where resection of the shaft of the humerus in its lower third had been commenced, the elbow not being supposed to be injured, such a considerable extent of injury was found, that the epiphysis of the humerus was also removed. This case proceeded as favorably as the others, and, after the arm had become much shortened, it healed with almost complete ankylosis, although in all a piece of four inches in length, of the entire volume of the humerus, had been removed.

Method of Operating.—Esmarch states that he has tried very many different methods, but in his last campaign, he, and his associates, operated solely on Liston's method, with certain modifications, which partly rendered it essentially more easy of performance, partly was necessitated by the varying extent of the injury to bone.

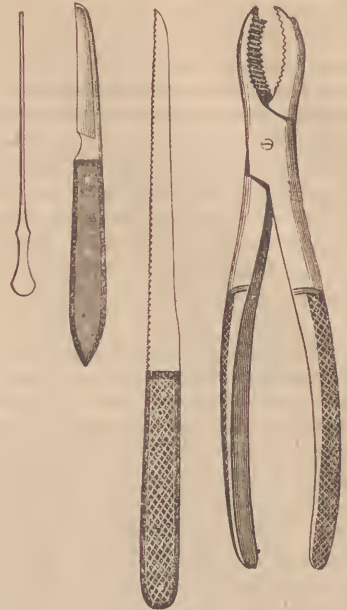
All methods in which osteotomes, chain-saws, and other complicated instruments are necessary, are, of course, not to be used in war. The following set of instruments (fig. 1) are recommended by W. T. Statham, the translator of Dr. Stromeyer's work, who was in service at the termination of the last Schleswig-Holstein campaign, and who has employed them in several cases of resection, but he differs from the author by treating the patient with tonics throughout, at the same time the inflammation is treated antiphlogistically. He also objects to Dr. Stromeyer's operation for "resection of the shoulder-joint, as the transverse incision is very apt to gap, and that, even to the extent of three inches, so that, of course, in such cases the sutures are of no use, or serrate the skin."

As many of our young army surgeons have never practiced the operation of resection of the elbow-joint, we will give the details and after treatment for their benefit:*

"To resect the elbow-joint quickly, and with the simplest instruments, it is first requisite to lay open the whole joint so freely that the ends of the bones can be easily thrust out of the wound. This is only possible by opening the joint on the posterior surface, as there is here no other important vessel or nerve, except the ulnar nerve. Earlier operators have at once divided this nerve; and doubtless, in many cases, reunion with restoration of function has taken place. As this can, however, be easily avoided, it is absolute requisite, for performing this operation in a scientific manner, to preserve this nerve, unless indeed the internal con-

dyle of the humerus is comminuted, and the nerve torn across at the same time.

Fig. 1.



Steel Probe (not too much hardened) for examining if the bone is softened.

Blunt-pointed Knife (Langenbeck's) for deep operations on bones. The blade is continued down to the handle. The edge should be soft rather than hard.

Saw for division of any long bone, without thoroughly exposing it, (Langenbeck's.)

Resection Forceps altered from gas-fitter pincers, (Statham's.) The above instruments can be had of Mr. Kolbe of this city.

For this operation the patient was laid on his back, on a table covered by a mattress, with the posterior surface of the wounded arm turned to the light, and lying on a long cushion covered with oil-cloth. If the patient lays prone, the operation is certainly easier, but we preferred the method described on account of its being less dangerous to administer chloroform. An able assistant held the arm, a second is required to move the fore-arm according to the wishes of the operator. As soon as the patient was under the influence of chloroform, an incision, three inches in length, was made on the outer side of the ulnar nerve, to divide the skin and subcutaneous cellular tissue. This incision must begin just above the point of the olecranon on the inner side of the tendon of the triceps, proceed along the inner edge of the olecranon—and below the same, corresponding to the direction of the crista ulnæ, be carried a little more outwardly. The second incision is carried from over the humero-radial joint transversely over the olecranon into the middle of the first—meeting it at a right angle. Earlier operators have now opened the sheath of the ulnar, and drawn it to the inner side by means of a blunt-

* Dr. Friedrick Esmarch on Resection in Gun-shot Injuries: Translation of S. F. Statham. London, 1860, pp. 82-87.

hook. The operation is thus much easier and even a less practised surgeon does not run the danger of wounding the nerve. The Surgeon in Chief, Dr. Stromeyer, in general therefore recommended this method to younger surgeons performing the operation for the first time. The nerve is thus, however, injured. If the operation is performed with suitable care, this nerve is not at all seen—by adopting the following procedure.

After the incisions in the skin, the fore-arm is somewhat flexed, and the capsule of the joint opened at once on the inner side of the olecranon. The edge of the capsule is now either seized by hooked forceps, or the edge of the wound is drawn by the left thumb sufficiently inwards, for its nail* to stretch the incised portion of the capsule. Repeated incisions are now carried along the inner border of the olecranon direct upon the internal condyle, by which the soft parts are entirely separated from the bone. These incisions must follow one another at the most at the distance of half a line, and the edge of the knife must always cut on the bone; for by this means only can the periosteum, covering the inner condyle be left in connection with the capsule, and all the soft parts above it be dissected back without injury.

The knife is generally blunted during this stage of the operation, but when this is ended, the greatest difficulty is overcome. This method is especially necessary in all resections, if the periosteum is to be preserved and the soft parts injured as little as possible. As the exposure of the inner condyle is the point to be affected by any one wishing to become master of the operation, its practise on the dead body is especially to be recommended to every surgeon.

When the internal condyle, which often projects very far, is laid bare to its point, the soft parts are to be drawn away by the left thumb, and the periosteum from it as before described for the olecranon. After this, the position of the ulnar nerve may be recognized by a prolonged swelling on the inner side of the soft parts turned back from the condyle; but the sheath of the nerve itself cannot be seen, as it is covered by a portion of the capsule, of periosteum, and by a thin layer of cellular tissue.

The third stage of the operation is now proceeded with—that is, the complete opening of the joint. The internal lateral ligament, already laid bare, is first divided in its middle. The arm being then much flexed the tendon of the triceps is freed by the knife from the olecranon, and the incision prolonged outwards and downwards to the head of the radius, so as to divide the anconeus from the ulna and also to open the capsule in this position. By means of a transverse incision, the external lateral—and the radial annular—ligaments are divided, and the head of the radius exposed. The whole joint now gapes widely on strong flexion of the fore-arm so as to touch the arm—and then by taking hold of the olecranon and drawing it

from the humerus, one is generally at once able to divide the anterior portion of the capsule with the knife. If the joint-ends do not yet separate sufficiently, it depends upon the lateral ligaments not having been fully severed; the portion in fault, whether internal or external, must be sought for by the fore-finger, and at once divided by the knife. If a large portion of the ulna is to be removed, the attachment of the brachialis anticus must be separated from the coronoid process, taking care not to wound the brachial artery; we have often used Langenbeck's blunt-pointed knife for this portion of the operation—if care is taken to cut only against the bone, a pointed knife is equally serviceable for the purpose.

The joint-ends of the three bones can now be thrust far enough out of the wound so as to be removed by an ordinary amputating saw. In cases, where there was but a slight injury to bone, as for example, when only the olecranon was comminuted, or the joint-surface of the humerus grazed, we sawed off the head of the radius, the epiphysis of the ulna close below the coronoid process, and the whole end of the humerus covered by cartilage. If it was necessary to take off a larger piece from one bone, so much less was removed from the others. If, for example, the lower end of the humerus was comminuted to such an extent, that, after removal of the splinters and truncation of the sharp points, three to four inches were found to be lost—we left the ulna and radius untouched; if the loss of substance was less, the olecranon, or only the upper half of the same was sawn off, as its projection, against the end of the resected humerus, easily induces pain and increases the probability of ankylosis. If we were obliged to resect large portions of the ulna and radius, we left the end of the humerus similarly untouched.

At first we occasionally attempted to remove the cartilage with a knife; this is troublesome, however, and wastes time and cannot be effected completely, moreover, as it appeared to have no influence on the further course of the case, we did not do so latterly. The cartilage softened soon after the occurrence of suppuration, and freeing itself in larger or smaller pieces, came away with the pus from the wound.

Esmarch has already mentioned that in the year 1850, they only resected the elbow-joint after Liston's method. In the campaign of 1849, Dr. Stromeyer at first resected after Jaeger's manner, as being the easiest to show to the younger surgeons; this consists in H-formed incisions, the two flaps of which are dissected back. After the sheath of the ulnar nerve was opened, this was drawn to the side and the operation then proceeded with, as already described. In three cases we added another incision to Liston's J-formed one, by making a short one parallel to the longitudinal one, commencing above the humero-radial joint and carried either upwards or downwards.

This was done according as the humerus or ulna were comminuted. The wound thus became —(—shaped, and the removal of a large piece of bone was much facilitated. By this means Liston's method of incising the skin sufficed for all cases, and the method already described was later always employed, viz: in twenty-seven cases.

The Surgeon-in-Chief, Dr. Langenbeck, preferred to make a single longitudinal incision, three inches in length, on the inner side of the olecranon, corresponding to the course of the ulnar, and the method of dissecting back this nerve from the internal condyle was first taught by him. If the soft parts are not yet much swollen, the ends of the bones may be easily thrust out from such an incision. As soon, however, as a considerable serous or inflammatory infiltration has come on, as generally occurs after gun-shot injuries, it is necessary to lengthen the incision too much, to prevent tearing or brasing the skin. This method was employed three times.

In a case where the lower end of the humerus was comminuted, Dr. Stromeyer made a semicircular incision, the convexity downwards, in the same way as is given by Guepratte. This method has no special advantage and the exposure of the internal condyle becomes somewhat more difficult.

If the ulna is struck below the joint and the splintering extends into the same, and to to such an extent that it is unnecessary to remove any portion of the humerus—it is not requisite to expose the internal condyle. In such cases the joint may be opened outside the olecranon, and the fragments be dissected out one after the other. The internal lateral ligament may be divided from the joint-cavity—merely taking care to avoid the ulnar nerve. Similarly all the soft parts over the epiphysis of the humerus are as little as possible to be meddled with.

If the resection is undertaken sometime after the reception of the wound, the hemorrhage is at first free, as the smaller arteries of the skin and cellular tissue are much enlarged by the inflammation. However, we never compressed the brachial artery, as the bleeding could only be of service to the patient, and, besides, would generally cease during the operation.

After completion of the operation, the centre of the longitudinal incision was usually left open for the escape of matter, and the remainder of the wound united by interrupted sutures. We have not seldom seen a partial union of the wound follow by first intention.

If, however, one or both gun-shot wounds were on the posterior surface of the elbow, we at once changed the direction of the incisions so that they should run through the openings, and then left this portion of the wound open, as we could not expect that the contused borders would heal by the first intention.

After-Treatment.—Stromeyer was certainly

right in considering the quiet and comfortable position of the arm as one of the most important points of the whole after-treatment. By his direction the arm was laid at once, after the operation, on a smooth wooden splint, padded with wool and covered by oil-cloth. This reached from the upper third of the arm to the finger-ends, and, at the elbow, was in an obtuse angle of 140 degrees. A hole, the size of a crown, was cut in the splint to allow the internal condyle of the humerus, if left, to be protected from injury. This splint lay near the patient on a large chaff cushion, the arm was laid prone upon it, and kept in position by some turns of a roller above and below. The wound was dressed at first with cold, afterwards with warm water, when the suppuration diminished; charpie, dipped in ordinary oil, was applied.

Stromeyer laid great stress upon the arm never being raised from the splint during this treatment. The charpie was laid around the wound sufficiently to take up the secretions from it, and, if care is taken for this object, the arm can be kept thoroughly clean. It is only necessary to dry the under surface of the arm from pus, by small masses of charpie or sponge, by means of the spatula and forceps.

If purulent deposits form deeply, their contents must not be emptied by pressure towards the wound, as the evil is thus increased; but poultices and early incisions must be employed in suitable spots, so as to allow free issue of the matter. If the arm becomes oedematous, bandages are of great service, of course, however, many short pieces, of a foot to a foot and a-half long, must be employed, so that the arm shall never be raised from the splint. It is only when the wound is filled with granulations, and cicatrization has already commenced—that the arm may be carefully raised from the splint, and a roller be employed; a flannel one is best for this state of the arm. At this time, also, warm baths for the whole arm are of great service; by this means, especially, the freedom of motion of the arm and fingers is greatly aided.

The effect of movement in the production of false joints after fracture is well known; it is in the same way of great importance to institute passive motion of the elbow sufficiently early, in order to insure the usefulness of the arm. It may be commenced with care before the wound is fully cicatrized, but, as soon as irritation is caused and the granulations acquire a worse appearance—it must be omitted or very severe inflammatory symptoms or hemorrhage will easily occur.

If all the wounds are fully cicatrized, the patient must make up his mind to bend, extend and rotate the arm frequently by means of the sound one, and the surgeon himself must perform the same passive motions of the arm whenever he makes his visit, or cause it to be done by an assistant or by another patient. As this practice is painful, the patient readily

omits it, even when directed not to do so. I believe it is to this circumstance chiefly that must be ascribed, the more or less ankylosed joints that frequently occurred. As, in war-time, the surgeon who first attended the case, easily loses sight of it, often before the wounds are fully cicatrized, by the patient being transferred to a distant hospital, where the surgeon is not so attentive in insuring motion of the joint as the operator himself, who wishes that as good a result as possible may be obtained from his operation.

The great importance of proper after-treatment, as regards the later usefulness of the limb, was decidedly shown in patients resected in the elbow by us at Schleswig, after the battle of Idstedt, and who later were treated in the Danish hospital. The Danish surgeons have not, to my knowledge, performed this operation, and the majority of them, therefore, were not likely to know the value of passive motion in such cases. Hence, it happened, that when these patients returned from captivity, in the beginning of 1851, most of them had their arms in a very bad condition, and in part possessing neither motion nor proper sensibility. These evils could be partially bettered by means of warm baths and methodical passive motion. Yet the mobility of the arms of those patients resected after the storming of Friedrichstadt—that is, almost two and a-half months later than the others—had advanced much farther at the time of the return of the former.

As the mobility of the fore-arm after the operation does not wholly depend upon the size of the portions of bone removed, it will be understood that the joints, in some patients, from whom portions of considerable extent had been taken away, nevertheless resulted in ankylosis, while great freedom of motion existed in others from whom but small portions had been removed. On the whole, it is preferable to take away more rather than less, as the probability of later mobility is thereby increased. In general, therefore, we removed the cartilaginous extremities of all the bones, even if but one of them had been slightly injured.

The greater number of patients with ankylosis of the joints, did not have the arm at a right angle, but at an obtuse angle of 130 to 140 degrees. This is because this position is the only comfortable one for the patient while in bed. We have frequently observed that, when the fore-arm was more flexed, the patients complained of excessive pain, which only ceased on the arm being more extended.

GUN-SHOT WOUNDS OF THE HIP JOINT.

Military surgeons all agree in the almost certain fatality of gun-shot wounds of the hip-joint. In such severe injuries, three courses are open to the surgeon—First, to leave the case to nature; secondly, to amputate at the hip-joint; thirdly, to resect the joint. When

left to nature, the patient dies in a few weeks or months, worn out with pain and suffering; submitted to amputation at the hip-joint, he rarely survives. The operation by which he has the best chance for his life is resection, which was first performed for gun-shot injury by Oppenheim, and more recently, under Stromeyer's direction, by Dr. Schwartz, in May, 1849.*

The whole number of cases of resection of the hip-joint which has been performed (up to 1860) is 71, the first operator being Anthony White,† in 1815 or 1818, and the results being 33 deaths, 33 cures, and 5 unknown. Dr. John Rhea Barton was the first American surgeon who performed partial resection with success, in 1827; about four years after, Dr. J. K. Rodgers, of New York, performed the same operation with equally good results, (1840.) Subsequently, in 1844, Mr. Ferguson excised the head of the bone for caries, successfully.

GUN-SHOT WOUNDS OF THE KNEE-JOINT.

These wounds are considered very dangerous, owing to the laceration of the capsule, which has led to the practice of amputation. The following are the results of resection of the knee-joint, which has been performed in 183 cases, the first operator being Filkin, of Northwich, in 1762, the results being 54 deaths, 125 cures, and 4 unknown; partial resection of the knee-joint in 36 cases, the results being 16 deaths, and 20 cures. Stromeyer says of gun-shot injuries of this joint—I have not undertaken resection of the knee-joint because it affords little hope, even under favorable circumstances, and because, in the majority of cases, it cannot certainly be known how much of the bone should be cut off. Three cases are all that have been reported by military surgeons: one in the Schleswig-Holstein war, and two in the Crimea, two fatal, one recovery.

We are glad to see that the Medical Director of the United States army desires that exsection of the shoulder and elbow-joints shall be resorted to in preference to amputation, in all

* This operation consisted in removing the lower fragment with the saw, and in ex-articulating the upper one—it was neither difficult of execution, nor attended by hemorrhage, yet, after some days, the patient died of pyæmia, and, on autopsy, it was found that a part of the ischium had been shattered by the bullet. Dr. Stromeyer's conclusion is, that he should, in any case, as Oppenheim, give the preference to resection, and that after the occurrence of suppuratio, because then the operation is much easier, and because after some continuance of the formation of matter, it can better be expected that the patient will not sink under pyæmia.

† This bold and hazardous operation was first recommended by W. Charles White, of Manchester, in 1769.

cases offering a reasonable hope of success, and that Pirogoff's operation at the ankle should be preferred to Chopart's, through the middle of the ankle.

GUN-SHOT INJURIES OF THE FOOT.

Dr. Stromeyer considers the most dangerous are those caused by fragments of bombs; the whole number which he has seen proved fatal, either by mortification and rapid collapse, or by tetanus. Injuries of the foot by musket bullets are not so dangerous, and heal well under favorable circumstances. The number of cases of total resection of the foot-joint, 22, amongst which are 3 deaths and 19 cures; partial resection of the same in 77 cases, 8 deaths and 69 cures.

RESECTION OF THE ASTRAGALUS.

There has been 67 cases of resection of the astragalus, 9 deaths and 58 cures. Fab. Hildanus being the first operator, in 1670.

GUN-SHOT INJURIES OF THE CALCANEUM.

The calcaneum has been resected in 84 cases, with only 1 death and 83 cures, the first operator being by Fornisius, in 1669, etc. (Heyfelder.)

Grazing shots, with exposure and injury of the *calcaneum*, heal successfully under simple treatment; so, also, of the tarsus.

Of the many gun-shot injuries of the *metatarsus*, which Dr. Stromeyer has seen, one only proved fatal.

As regards injuries of the *Toes*, the same treatment holds good for them as for injuries of the fingers; he considers amputation as unnecessary, as recovery readily occurs without its employment. As, however, much pain is occasionally experienced, opium must be administered, and poultices should be employed in good time. It will thus be seen that he differs from the great English authority, Guthrie, who asserts that amputation generally follows the use of the poultice. Without going as far as Guthrie in the condemnation of the poultice, we have seen, both in hospital and private practice, injury from the long-continued application of them; they require care in their management, and should be omitted as soon as the surgeon considers proper, and not depending on the feelings of the patient.

AMPUTATION.

Derived from the Latin Amputo, to cut off.—We divide the operation into circular, flap, and oval.

Next as to time of operating, called primary, if performed as soon as the patient become fit for it, after the reception of any injury. Wait always until reaction comes on. If the limb be mangled so as to be useless, give him stimulants, tranquilize his mind, let his skin become warm, then operate. On the field, hospital, and in private practice, this is the best and most successful period. Secondary amputation is that performed after the suppurative process has set in, and life is endangered from sloughing or the suppuration; this is more fatal than primary. The operation of continuity are those performed through the body of a bone; those of contiguity are performed through a joint, while those of necessity are such from the magnitude of the injury. Those of choice, when the limb has become partially or entirely useless. Never amputate if the limb is the slightest degree useful, or to gratify a patient's whim. The circumstances which are favorable for the operation are youth; habit somewhat reduced, but not too weak, cheerful temperament, good general health, simple wound, disease or accident, at a distance from the trunk and the upper extremities. Though a most simple operation, statistics show it to be a most hazardous, and therefore demanding the highest surgical skill as to its propriety and the proper time. Its mortality is greater than that for the operation of stone, being one-third or one-quarter, while stone is only one-eighth. Never operate unless compelled by necessity to do so until you have prepared your patient, if he is debilitated and have hectic fever; stimulate, give him good nutritious diet and opiates; keep him in a dark room, and always use ether, or a mixture of ether and chloroform, as patients in such a condition can bear but little pain. If he be vigorous and reaction is considerable, bleed. The following are the most important points of the operation. The patient is placed comfortably recumbent on a board or table of convenient height for the operation. The surgeon places himself on the left of his patient, so that he can use his right hand. The sound limb is held steady, and out of the way by an assistant. Another trustworthy assistant is ready to control the hemorrhage, by the pressure of his own fingers, or by the tourniquet, (but pressure should not be applied until the knife is just about to cut, so as to avoid venous congestion. Have conveniently arranged near you: ether, chloroform, tourniquet, bandages, lint, ligatures, silk and silver sutures, knives, saw, cut-

ting-pliers, artery forceps, sponges, oil, brandy, wine, and water.

As the circular amputation was the first one used in surgery, we shall describe it first. It was introduced by Celsus, and modified by Des-sault. Some are great sticklers for this operation, but I prefer the flap from the fact that it takes less time, three-quarters of a minute are enough, while five or six is required for the circular.

The circular amputation is performed thus, sup-posing the thigh to be the part concerned. An assistant, grasping the limb with both his hands, draws up the skin as far as possible. The surgeon holding the knife lightly, and with his arm at first placed under the thigh, divides the skin and cellular tissue in one continuous sweep, and turns it up like a coat cuff. The muscles are then divided in two successive layers, each layer (being held upwards by a retractor, a portion of linen or leather slit at one end,) in such a manner that their contraction will form an inverted cone, and the vessels tied. Flaps are brought together, so as to form a line from before backwards, if the patient lie upon his back, or laterally, if he lie upon his side, to let the pus and fluids escape from the wound. It is less difficult to secure the vessels in the circular operation. It is best to be applied to those limbs containing but one bone, and not much muscular tissue.

The flap operation was first introduced in England, and afterwards modified in France. It consists in making a single or double flap, this flap having the shape of a cone, the apex being at the bottom of the wound when the bone is sawn off. It is generally performed with a long knife, called a catlin. After applying compression to the main vessel, the muscular tissue is seized with the hand, the knife plunged to the bone, passing over it, and carried out at the opposite side, sliding it down with a sawing motion sufficiently far to make a proper flap, then withdrawn, and passed out on the opposite side. If a single flap be made, that must be sufficient to cover the whole wounded surface. The third or oval operation was introduced by Langenbeck; the wound has an oval shape; best applied at the shoulder, and commissure of fingers and toes. For the operation at the shoulder, the operation of Baron Larrey is preferred.

The dressings, after the amputation, should be of the most simple kind. Sutures of silver wire or silk, strapping with adhesive plaster,

lint or linen dipped in cold water, and careful bandage. Some most serious accidents, at times, occur during and after the operation, as for instance, hemorrhage, intense pain from ligature of nerve, etc., and even convulsions. Since the introduction of ether and chloroform, the three latter have been almost entirely overcome. Your patient must, therefore, be carefully watched. Arrest hemorrhage by the ligature and astringents, as before described. *Inflammation of the stump*, on its first appearance, use active antiphlogistic means to arrest it. *Conical stump*; this is caused by the surgeon not saving sufficient flap; this can only be cured by a second operation; cicatrix is sometimes very tender, and bleed on applying an artificial limb, or small tumors form on the end of the stump; apply astringents and tincture of iodine, or even remove the tumors. If abscesses and sinuses of the stump occur, let out the pus, placing the opening in the most dependent position. Necrosis and caries of the stump were common under the old mode of heavy top dressing, since the employment of light and cold water not so much trouble arises from this source. Cystitis sometimes occurs, known by all the signs of irritable bladder, at first increased desire to urinate, etc.; treat antiphlogistically at first, followed by opiates tinct. cantharides and very careful diet. Phlebitis, followed by metastatic or pyemic abscess in the brain, lungs, or liver, treat by mercury and opium.

AMPUTATION IN GUN-SHOT WOUNDS.

Period for Primary Amputation.—The great majority of intelligent and well read surgeons adhere to the principle which was introduced into practice by the English and French military surgeons during the wars of Napoleon, by amputating, as soon as possible, after the wounded man has recovered from the first shock. The great importance of this recovery I have dwelt upon before, wine or brandy being administered before the use of the ether or the chloroform.

The three Schleswig-Holstein campaigns, and the results of the Crimean war, afford new proofs of the correctness of these principles. Amputations within the first twenty-four hours give the best chances for the preservation of life. On the second day the prognosis is somewhat more unfavorable, if the wounded have been conveyed to a distance, and the limbs are infiltrated; on the third and fourth days the

prognosis is worse, but improves gradually from the sixth day.

Drs. Tripler, Gross, and Hamilton, in their works on Military Surgery, when treating of amputation, are agreed in advising the primary operation. Tripler recommends the adoption of the flap operation in the arm and thigh, but prefers the circular for the forearm and leg, where time is of great importance. Hamilton advises the flap operation. Dr. Scrive, Surgeon-General of the French army in the Crimea, makes but one exception to the rule of primitive amputation, and that is in the operation at the hip-joint.

Period for Secondary Amputation.—According to Hennen and Stromeyer, this operation should only be performed after the patient has been removed into a pure atmosphere, and a free supply of it, and then select the most favorable period for its performance.

2. This operation should be performed in cases of gangrene, where it is not likely that a stump suitable for healing will be formed.

3. In cases of arterial hemorrhage, complicated with gun-shot fracture, where the hemorrhage cannot be arrested by the ligature at a distance from the wound.

4. In cases of profuse suppuration.

5. For deformity or uselessness of a limb.

6. In all cases in which the diagnosis has been established too late to admit of primary amputation.

The following are the Indications for Amputation or Exarticulation on the field of battle.—The precision and rich original experience, which are shown by Dr. Stromeyer, on this important subject, induces me to lay the following extract before my readers.

General Indications.—1. When a large limb has been carried away by any projectile, and it is desirable to replace the contused and lacerated wound by a clean one; if the bone projects, this must also be sawed off. 2. Fingers and toes scarcely ever require amputation; of seventy-three gun-shot fractures of the hand and fingers, seven only were amputated. 3. When the lesion of a limb is such to preclude the possibility of its further existence, dependent upon nerves and blood vessels; or of its usefulness, dependent upon bones and muscles. 4. When a grazing shot of heavy calibre has left the skin uninjured, but has destroyed the bony and soft parts—Dr. B. Beck,* a distinguished surgeon of the Aus-

trian army, performed amputation in such a case.

Special Indications.—I. Upper extremities. The indications differ from those presented in injury of the lower extremities, because, according to the statistics of Dr. Esmarch, all wounds of the upper limbs heal more readily than wounds of the lower, and wounds of the right arm with more readiness than those of the left. Amputation of the upper extremities is indicated only when vessels and nerves are injured at the same time, or when fracture exists along with rupture of the great blood vessels, or after considerable loss of substance of the soft parts.

The special indications are:—1. When the arm has been carried away by a large projectile, or has been lacerated and broken to such an extent as to preclude the possibility of its preservation. In the diagnosis of these cases great care is required to ascertain whether the organs of the chest or abdomen have sustained injuries which necessarily must be followed by fatal results. 2. When the brachial plexus has been divided by a shot in the upper arm, so as to deprive the whole hand of mobility and sensibility. Under these circumstances the brachial artery must have been torn, and the radial pulse have ceased. 3. When the humerus is fractured and the brachial artery is torn. Even if there is no hemorrhage at the time, the cessation of the radial pulse is sufficient proof of the division of the artery. 4. When the elbow joint is shattered, and the brachial artery divided. 5. When the wrist-joint or wrist has been perforated by a ball in one of its larger diameters. A shot, piercing the wrist in the direction from the dorsal to the palmar surface, without injuring either radial or ulnar arteries does not involve the necessity of amputation. No lesion of bones of the upper extremities, by either rifle or cartridge-ball is, in itself, an indication for amputation. Wounds of the brachial artery alone, do not require amputation. Rupture of the median radial, or ulnar nerves alone, or in combination with gun-shot fracture, does not involve the necessity of amputation.

II. *Lower Extremities.*—1. When a part of the leg has been carried away by a heavy shot, or has sustained an irreparable loss of soft parts, or has suffered a subcutaneous comminuted fracture, with crushing of the soft parts. 2.

therefore, the surgeons shall enjoy advantages and distinctions in every respect equal to those officers." He kept his promise, as Dr. Beck returned with the well-deserved order of merit, I sincerely trust our government will follow so good an example.

*It is with pleasure that we record the following order of an Austrian general, addressed to his troops. "I see every where military officers and surgeons equally exposed to the fire, and,

When the crural or popliteal artery and vein are ruptured, and the circulation in the lower part of the limb has ceased, even if there is no hemorrhage from the wound for the moment. 3. When the femur is shattered and its fragments have been carried in the direction of the large blood-vessels. 4. When the femur is shattered to a great extent, upwards and downwards, as is frequently the effect of a grape shot. 5. When the femur is broken, and the sciatic nerve ruptured. Division of the sciatic nerve alone does not indicate amputation. Dr. Stromeyer saw the injury three times followed by a favorable result. In one case trismus supervened. In the favorable cases paralysis continued in the parts supplied by the nerve, but the limb was still more useful than a wooden leg. 6. When the knee-joint has been perforated by a ball, and its articulating ends are shattered to such an extent as to give rise to immediate inflammatory swelling, should the patient require to be removed. Even in those cases where, after perforation of the synovial membrane, the lesion of the bone consists only of a simple impression or contusion, amputation is, according to universal experience, the only means of saving the patient's life. But, in this case, the operation may be delayed till the patient has arrived in a hospital, conveyance not having the same injurious influence upon the state of the wound as it has when extensive shattering is present. 7. When the tibia has been extensively shattered directly below the knee-joint, so that fissures enter the joint, which can be ascertained without difficulty. In this case, too, it is advisable to delay amputation till the arrival of the patient at the hospital, if it be near. 8. When the tibia and fibula have been fractured and extensively shattered by a ball. Under various favorable circumstances, however, the leg may be preserved in this case. 9. When the tibia alone has been shattered to a large extent. In this case the leg may possibly be saved, but this is not very probable. 10. When the ankle-joint has been perforated by a ball in one of its longer diameters, so that extensive shattering or splintering of the tibia or astragalus, or of both, may be inferred to have been produced. Simple grazing shots, with opening of the synovial membrane of the ankle-joint, admit of conservative treatment, with the exception of those cases in which a great portion of the malleolus externus has been lost; an injury which causes the foot to take the shape of a valgus, and makes it use-

less. 11. When the anterior part of the foot has been crushed by heavy shot. The only lesion of the foot by rifle-balls, requiring amputation, is shattering of the astragalus, as a component part of the ankle-joint.

When upon the subject of the removal of foreign bodies from wounds inflicted by firearms, we dwelt at some length upon the importance of having properly constructed forceps for the removal of leaden bullets, and illustrated our remarks by cuts of the ordinary forms, and a new modification by D. W. Kolbe. We have the pleasure of again bringing the subject before our readers, by giving them a drawing and description of a most simple but admirable instrument for the removal of leaden bullets, more especially the Minié-rifle ball, which is so destructive to life in modern warfare. This instrument is the invention of an ingenious Surgeon of this city, Dr. Richard J. Levis, to whom the profession are indebted for several other valuable improvements in surgical appliances.

It consists of a steel tube ten inches long, with a hook-shaped projection at one end, terminating in a sharp point, which presents back toward the tube. Within the tube slides a steel rod sharply pointed at one end, and having a button-shaped handle at the other. When the end of the instrument can be made to touch the bullet, any convex or projecting surface on it may be seized and firmly held between the points, which are pressed into the lead. If the instrument should be withdrawn without the bullet, the point on the sliding rod should first be pushed in contact with the other point, thus effectually guarding the hook from catching in the tissues. The instrument, which is represented reduced in size in the cut, occupies but little more space than the ordinary bullet probe, and may be used for that purpose. It can be more readily introduced in the track of a projectile than the bullet forceps, and in security of hold on the bullet, it exceeds any contrivance which has been heretofore presented.

CONCUSSION OF THE BRAIN.

Dupuytren was the first to draw attention to the circumstance that concussion of the brain might be produced without injury to the bony covering, and attributed the possibility of its occurrence to the elasticity of the skull. He was borne out by Von Walther, who said that every concussion of the brain was combined with some contusion of that organ.



Dr. Stromeyer goes a step further, and thinks that concussion of the brain is in fact *nothing else but contusion of that organ*, which, in its momentary compression, may have suffered many and different injuries in its substance.

We should also remember, for our encouragement, the valuable observations of M. Quesnay. The brain is formed of such delicate substance, and its functions are generally so important to life, that it would seem as if the smallest shock, or the slightest wound, would cause irreparable injury, and attack life at its fountain-head. We have, however, numberless observations serving to dispel this groundless fear, from which we learn that of wounds this organ, especially those of the cortical and medullary substances, heal almost as readily as wounds of most other viscera.

Concussion of the Brain is divided into two forms—

1st. *Simple form*, where an interruption only of the functions of the organ follows the injury.

2d. The complicated form, where the brain itself is injured, and associated with extravasation of blood either upon or within its structure.

Treatment under the head of “simple concussion”—Rest, application of cold to the head, warmth to the feet, and, in some few instances, the administration of a mild purgative. Symptoms—Loss of consciousness, more or less perfect; also, loss of motion. If the patient is seen at this time the skin will be found cold, and the features more or less contracted, the pulse low and intermittent, pupils very variable, in some cases dilated, in others contracted, and in a third class one will be dilated and the other contracted.

In fifty-six examples of this description, in eight of which scalp wound existed, by the above treatment, perfect recovery ensued.

CONCUSSION OF THE BRAIN, COMPLICATED WITH SOME LESION OF ITS STRUCTURE, OR EXTRAVASATION OF BLOOD.

In these cases there will be found some extravasation of blood either upon its surface or within the membranes, or within the meshes of the pia mater, and if the latter, some ecchymosis of the cerebral convolutions will generally be present.

As inflammation soon shows itself after such severe complication, the rule of practice is to push the antiphlogistic treatment to the utmost; to employ mercury with great freedom, both internally and externally, and also counter-irritation. Mr. Andrew Ellis, of Dublin, orders the head to be shaved, and the following lotion to be applied to the swelling, if ice cannot be had.

R.—Muriatis Ammonizæ, - - ʒij.
Aceti Destillati, - - - fʒij.
Aquæ Destillatæ, - - - fʒix. M.
ft. lotio more dicto applicanda.

Giving internally calomel and pulvis antimonialis.

FRACTURE OF THE SKULL.

A bloody tumor of the scalp is liable to be mistaken by young surgeons for a depressed fracture of the skull, more especially if it should be attended with general symptoms as indicate injury of the brain.

The symptom which a bloody tumor may have in common with a depressed fracture, is the yielding spot in the centre of the tumor, while it is circumscribed by a firm margin. In order to ascertain, as far as possible, the precise nature of a doubtful case, the surgeon should pass his finger for some distance over the tumefied part, and if it were merely an extravasation of blood, the finger would, in the first instance, rise over the elevated margin of the swelling, and then sink into a little well in the centre. If strong pressure be now made with the finger, the bone may be felt beneath, and no convulsive twichings of the muscles, or other symptoms indicative of compression of the brain excited; whereas, if the case were a depressed fracture only, the finger would not rise above the natural level of the scalp, previous to its sinking into the cavity caused by the depressed state of the bone. In the latter case pressure with the finger would, in all probability, produce symptoms of compression, or increase those which may have previously existed. In such cases we have almost always

COMPRESSION OF THE BRAIN.

The brain may be compressed by a fractured bone, foreign bodies, extravasated blood, pus, or serum. I have just informed you of the best way of distinguishing between a bloody tumor of the scalp and a depressed fracture unattended by a wound, and although you may not be able fully to satisfy yourself as to the exact nature of the case, you should not cut down to the bone. It is true that the surgeons of former years, if they found a fracture, no matter how simple, would not rest satisfied without cutting down to the bone, but they would even proceed to trepan the patient, being under the impression that it was necessary to do it in order to *prevent* the occurring bad symptoms. This was the advice of Pott.

In cases of fracture with obvious depression of the bone, but unattended with a wound or bad constitutional symptoms, the rule of practice at the present day is not to cut down through the scalp, but to treat the patient antiphlogistically on prophylactic principles.

If there is, however, any foreign body in the wound, or the bone be depressed, it should be elevated, and the foreign body removed.

In regard to the operation of trephining, which I stated was, in olden times, resorted to,

alas, too often, the following admirable rules are laid down by Ellis, of Dublin, in his *Clinical Surgery*:

"First. The operation being in itself dangerous and liable to cause death, should never be performed except, when, after mature consideration of the case, you have arrived at the conclusion, in your own mind, that it cannot render the patient's condition worse than it was before, and that, on the contrary, there is reason to suppose it is calculated to improve it.

"Secondly. In a case of compound fracture, with depression of the bone and bad constitutional symptoms, the operation ought to be performed with as little delay as possible.

"Thirdly. In a case of compound fracture with depressed bone, and a foreign body, although the constitutional symptoms may not be urgent, the operation ought to be performed; for, in such a case, the unnatural state of the parts must necessarily give rise to inflammation, which may prove fatal; or, if it do not, the probability is, that the patient will be subject to epilepsy, or some other disease of the brain, which will tend to shorten life."

Thomas Bryant, Lecturer upon Operative Surgery, at Guy's Hospital, has the following observations, published in 1860, upon the use of the trephine and other means of relieving compression of the brain, the result of a fall upon a sharp object, or a quick blow from a pointed one, that such symptoms, as a rule, are produced by local causes, such as depressed bone or extravasation of blood from rupture of the middle meningeal artery.

That such *local injuries*, when giving rise to general symptoms, should be treated by elevation of the bone, if depressed, but if no general symptoms are present, unless the bone is comminuted, and can be easily removed, no operation is indicated; a local pressing of the brain alone, unaccompanied with symptoms, generally doing well.

That when compression of the brain follows as a secondary result of a *local injury* over the course of the meningeal artery, that is, after an interval of time, when reaction has been established, although no depressed bone may be present, it is probably produced by a rupture of one of the arterial branches; the operation of trephining may be performed with a chance of success, although it is rare to find a very local extravasation, the blood generally passing downwards towards the base, where the operator cannot reach. That when com-

pression of the brain follows as a secondary result, a *general injury*—although that compression is evidently produced by extravasation of the blood—the operation of trephining is useless if not injurious.

"Extravasations within the skull, which are so important in civil practice, are of little importance in gunshot wounds of the skull. Those who know the symptoms of gunshot wounds with depression, will never be liable to confound their immediate symptoms, or their symptoms at the period of congestion, with those of traumatic extravasation. The diagnosis of these two conditions is well established by Dr. Stromeyer*, as well as the differential diagnosis of concussion from pressure on the brain. In the former, the symptoms are paleness of the face, a thin, weak pulse, quiet respiration, contracted or not materially altered pupils, and gradual decrease of the symptoms, which showed the highest intensity directly after the infliction of the injury. Pressure on the brain is accompanied by a flushed face, a full, slow pulse, snoring respiration, enlarged pupils, gradual increase of symptoms and paralysis of the body on the opposite side to that on which the head has been injured. Dr. Stromeyer has not observed a single case of gun-shot wound of the head in which he had been induced to attribute the symptoms to internal hemorrhage. Dr. Beck relates an interesting case of an officer, who died on the fifth day after having received the wound. He felt well enough to dine with his friends, and to write letters the night before the morning on which he suddenly died. Besides the gun-shot fracture of the occiput, the post-mortem examination revealed the presence of a large effusion of blood into the cavity of the skull.

"The chapter On Congestive and Inflammatory Reaction of the Head contains censures on the present state of therapeutics and the do-nothingism of our days. *Osteitis cranii traumatica* is anatomically well illustrated. The double direction which, under some circumstances, the motion of the blood takes in the veins of the diploë, is exemplified by the remarkable encysted hemorrhagic effusion of the skull described by Hecker, Dufour, and Stromeyer, which are produced by mechanical separation of the pericranium from the skull; the pouch being filled with blood from one of the large sinuses by means of one or more of the emissaria Santorini. These hemorrhagic cysts (*Varix traumaticus*, Bruns) become distended by blood on any congestion of the brain taking place, and empty their contents into the sinuses as soon as the cause of congestion subsides. They represent, on a large scale, the physiological process by which blood is drained from the external part of the head by the sinuses of the dura mater.

A case, where a girl of sixteen lost her whole

* Principles of Military Surgery. Translated by J. L. W. Thudichum, Hanover 1855.

scalp in a mill, and escaped with her life, is related as a proof that the skull may be deprived of most of its blood vessels without permanent damage. Hemorrhages from the diploë during trephining, as observed by Dupuytren, Hecker, and others, are explained by the compression which the congested and expanded brain exerts upon its venous sinuses. The question is put to pathologists, What relation does this arrangement of the circulation of the head bear to pyæmia, and what share has it in the production of that disease? The following case has a direct bearing on the question of pyæmia from wounds and diseases of the head, and shows moreover how much caution must be exercised before believing a pathological fact to be complete:

"In 1850, at Rendsburgh, Dr. Stromeyer was present at the post-mortem examination of a man who was said to have died from intropulsion of erysipelas of the head. He had suffered from erythema of the right side of the face, which had disappeared after twenty-four hours. The man had fallen into a soporose state, and died on the fourth day. Nothing worth noticing was found inside the skull. On opening the chest numerous pyæmic lobular abscesses were discovered in the lungs. Dr. Stromeyer now inquired whether the man had not had some small wound, and was informed, that before he entered the hospital he had a small boil just above the right eyebrow, which had been squeezed open by the surgeon of the regiment. Upon that the erythema set in, which caused him to be sent to the hospital. Though the seat of the small furuncle was not any longer clearly perceptible, yet Dr. Stromeyer caused the vein in the neighborhood of the spot to be laid free, and found it filled with pus up to where it entered the facial vein. From this insignificant place, therefore, the blood had been impregnated with pus. The short distance which the pus had to traverse in this case, in order to make its way into the right side of the heart, explains to some extent the rapid progress of the case."

Dr. Stromeyer afterwards saw at Kiel two similar cases of fatal boils of the upper lip. Professor Weber has collected seven cases of this kind, inclusive of Dr. Stromeyer's cases, which occurred at Kiel or in its neighborhood.

From all this, and from the fact that death always ensues under cerebral symptoms, it is likely that pyæmia occurring in patients with gun-shot wounds of the head, is the result of the entrance of pus through the large venous canals in the interior of the head.

Reaction of the Brain and its Membranes.—The direct consequence of any lesion of the brain or skull is a tendency to pyæmia, which easily passes into inflammation and its terminations. The inflammation following wounds of the head may be of two kinds,—acute (primary) or chronic (secondary); the former developing itself

out of the hyperæmia, which follows the lesions directly; the latter showing itself at a later period, even after weeks or months of apparently perfect good health. Primary encephalitis, with its congestive erethic, and paralytic states, the author describes in a practical manner. The post-mortem appearances are given; and of these we mention, as a remarkable feature, the fibrinous concretions in the sinuses and the veins of the cerebral membranes, into which they may be traced and followed for several inches. In secondary inflammation of the brain, the concretions are most frequently met with in the longitudinal sinus. They are, it seems, a natural sequel of acute encephalitis, and are formed of necessity whenever swelling of the brain compresses the superficial veins, if at the same time hyperinosis renders the blood more liable to coagulation. Coma and paralytic symptoms denote the formation of these concretions.

The modifications of inflammation of the brain by complications—such as concussion, internal hemorrhage, or depression—are made subjects of serious inquiry. On correct views regarding these points will depend the solution of the question, whether trephining should be resorted to or condemned.

The author gives a description of the transformations which the injured substance of the brain may undergo. The following is a brief summary of the intra-cranial lesions adverted to:

1. If the dura mater be injured, no further symptoms may arise. In this case the compressed part of the brain fills again with blood, after removal of the pressure, as Guthrie observed after extraction of depressed fragments or removal of extravasated blood.

2. The patient dies, and the substance of the brain is found, underneath the injured spot, in a state of red softening.

3. The dura mater is injured, and the contused brain comes into contact with the air. This case generally has a fatal issue, as was observed by Smucker. Dr. Stromeyer relates an illustrative case. The patient died of gangrene of the contused part of the brain, because the line of demarcation failed to be formed. This demarcation must be a double one; firstly in the brain itself, and, secondly, on the surface of the brain, so that a cohesion of this organ with the dura mater may take place, in order to protect the so-called sac of the dura mater against the admission of pus and ichor. Most patients die from the difficulties which stand in the way of the accomplishment of this process.

4. The dura mater has been disintegrated by the original injury, or has been cut into intentionally after trephining, or has been destroyed in the circumference of the wound by gangrene or ulceration. The case of a soldier is related, who was shot in the left part of the frontal bone. A fortnight after the injury had been inflicted, the brain protruded from the two open-

ings in the frontal bone, in consequence, as was found, of an abscess, three inches long, in the left anterior lobe, which had caused this enormous expansion of the brain (*fungus cerebri*). This case illustrates, also, the next-mentioned transformation of the contused part of the brain.

5. An abscess is formed, with or without expansion.* Von Walther says, that these abscesses are sometimes of a size beyond all conception.

6. The contused part of the brain remains constantly under the compression of the depressed part of the skull. It was known centuries since, that depressions of the skull might be healed without producing severe symptoms, and without leaving paralysis or impairment of mental powers. These observations did not fail to make an impression upon unprejudiced observers; and accordingly we find at all times some surgeons, at least, opposing the use of the trepan, and relying upon the efforts of nature. Three hundred years ago, Lafranchi, of Milan, said, that in fractures of the skull everything depended upon the assistance of the Holy Ghost, which the surgeon should implore above all things; trephining he found rarely necessary. The healing by nature of depressions of the skull failed to make a lasting impression, because such cases were believed to be rare exceptions. Surgeons went on trephining till they found by experience that in large hospitals recovery after this operation is an exception. It is only within the last twenty or thirty years that a more rational system has been followed, and that the operation of trephining is daily being confined within narrower limits.

The question which now presents itself is, what advantages are offered in a case of compression of the brain by a treatment which leaves the depressed pieces of skull undisturbed in their place? The following may be enumerated: 1. The wounded part is not irritated by a renewed injury. 2. The early congestion of the contused part of the brain, and the formation of extravasations, are avoided. 3. The air does not obtain free entrance to the dura mater, to the sac of the arachnoid, or to the brain. The advantages of subcutaneous wounds are sufficiently known, and will be appreciated with regard to the skull and brain, as well as to other parts.

The author devotes several pages to the description of pyæmic inflammation following wounds of the head. Secondary encephalitis and otitis engage the author to some length. Typhus and delirium tremens wind up the pathology.

Treatment.—Three hundred years ago, Lafranchi established the same limitation of the indications for trephining, which a surgical genius of our days—Dieffenbach—derived a second time from his practice. These principles Dr.

Stromeyer found to be correct from his own experience, regarding the fatality of the operation of trephining, and the recovery after considerable depression of the skull without that operation.

Dr. Stromeyer relates a series of cases, from his earliest surgical experience, in the year of the great comet (1811), to the present time. He records his experience during the seven years he devoted to the study of the profession. During three years out of these seven he attended the hospitals at Berlin, Vienna, London, and Paris, and yet he did not meet a single case in which the operation of trephining had been successfully resorted to, while many severe wounds of the skull came under his observation which recovered without any operation. Notwithstanding this, he adhered to the views taught by Dease and Astley Cooper, and supported by Brodie by the aid of statistics from the London hospitals, that in complicated fractures of the skull trephining must be resorted to, because of the threatening formation of pus. Further experience led the author to doubt the correctness of these views, principally because it became apparent to him that the air must exercise a deleterious influence upon a contused part of the brain, no matter whether it be admitted by trephining or by the simple removal of loose fragments of the skull. The latter operation had a very unfavorable issue in a case at Friburg, in 1848, and in another on the field, in 1849. Contemporaneously, Professor Langenbeck performed two similar operations at Flensburg, which shortly after terminated fatally.

After the battle of Kolding, in Schleswig (April 23d, 1849), there were eight gun-shot fractures of the skull, with depression, and more or less considerable brain symptoms, in the hospitals at Kolding, Christiansfelde, and Hadersleben. In all these cases, with only one exception, the detachment of the fragments was left to nature. The whole eight patients recovered perfectly. One patient, from whom some fragments were removed on the seventh day, was placed in considerable danger by this treatment. Dr. Stromeyer therefore resolved never to adopt it again. The treatment which brought these eight cases to a favorable issue was neither expectant nor operative, but simply antiphlogistic. Dr. Stromeyer recommended it to the younger surgeons, and had the pleasure of seeing that all depressed gun-shot fractures of the skull from small arms, no matter whether they injure the brain and dura mater or not, may be cured after this plan, without paralysis or interference with the other functions of the brain remaining, even when the state of sopor had lasted for weeks together. In 1850, after the storming of Friedrichstadt, in Schleswig, two young surgeons came under Dr. Stromeyer's care with gun-shot wounds of the head, accompanied by deep depression; they were both subjected to the non-operative treatment. In the first case, no venesection was required; in the second case

* Th. Fr. von Walther, *System der Chirurgie*, vol. ii, 1847, p. 58, 293.

life was only preserved by a venesection. Both recovered perfectly. A third case, that of a fusileer, terminated fatally from encephalitis, the surgeon in attendance upon him shunning bloodletting.

From the two campaigns of 1849 and 1850, Dr. Stromeyer possesses the notes of forty-one gunshot fractures of the skull, with depression, in which there was no doubt about the existence of fracture of the skull, because it was denuded. It is, however, doubtful whether the brain or the dura mater were injured, because this can only be ascertained by the escape of cerebral matter from the wound, or by extracting fragments at an early period. Of these forty-one cases, seven terminated fatally, one from abscess of the liver, one from typhus, two from primary encephalitis through neglect of antiphlogistic treatment, two from phlebitis encephalica, one from secondary encephalitis, in consequence of the patient visiting a public house. Thirty-four were cured, of whom one had been trephined by Dr. Ross, who afterwards described the case in the 'Deutsche Klinik.' This is the only case of trephining which gave a favorable result in all three campaigns. A soldier was wounded in the head at the storming of Friedrichstadt, and was transported by rail to Altona. He had been doing well for several days, when the acute encephalitis caused Dr. Ross to trephine him. A detached piece of the internal lamina was found under a slightly depressed part of the frontal bone. Notwithstanding the operation, seven venesections and sixty leeches were necessary to combat the continuing inflammation of the brain. It is to this energetic antiphlogistic treatment, and not to trephining, that Dr. Stromeyer attributes the successful termination of the case. The highest number of venesections ever employed by Dr. Stromeyer in cases of gunshot fracture, when trephining was not performed, was five; this occurred in a single case only, in 1849, when there was no ice to be had. Dr. Ross's case may serve to illustrate the disadvantages which trephining inflicts, even after healing of the wound. His patient, after being cured, was accidentally struck at the trephined place with the end of a whip-lash, or cord, which caused the reappearance of dangerous cerebral symptoms. Two cases in which the operation of trephining was resorted to unnecessarily by Dr. Beck and Dr. Ross, are severely criticised by Dr. Stromeyer, in which, we have no doubt, our readers will fully coincide.

Gunshot wounds of the head should, in their recent state, be examined with great care by the aid of the finger or the probe alone. They must not at first be dilated, under any pretext whatever, whether for the sake of diagnosis or of prophylactic treatment.

The exclusion of air, the presence of which favors the decomposition of the secretions of the wound, is indicated in all cases. This is best accomplished by a piece of fine linen,

when damp, adheres perfectly to the wound, and is to be removed at long intervals only. It is covered by some dry charpie, above which is placed a wet compress; a net made for the purpose fixes the whole dressing. Cold applications are made over the net. When these are discontinued the piece of linen next to the wound is moistened with oil. Every patient with a wound of the head must be watched. The best advice Sir Astley Cooper gives in his *Lectures on Wounds of the Head* is to visit a patient suffering from concussion of the brain at least three times a day. In all cases of wounds of the head great care should be taken not to let the right period for venesection pass by. With regard to local treatment, the cautious extraction of perfectly loose fragments and foreign bodies stands foremost. The removal of impacted balls should not be attempted. No fault must be avoided more carefully than that of attempting the extraction of necrosed pieces of bone at too early a period, since it produces no harm whatever to leave them longer than is actually necessary. Small incisions of the wound for the purpose of extraction should not be resorted to before the third week.

These principles are by no means new, nor is it necessary to turn to the declared adversaries of trephining in order to meet with them. Hennen, who in considerable depressions of the skull, trephined only when there were brain symptoms which did not at once yield to depletion of the vessels, says that it was not absolutely necessary to trephine for depressed fragments, though nobody would be hazardous enough to leave fragments which could easily be removed. He mentions the case of a man who, with a funnel-shaped depression one inch and a half deep, lived for thirteen years, and enjoyed a comfortable existence, provided he did not drink too much. Hennen had several specimens of that kind in his possession.

Space does not permit us to repeat the whole of the author's arguments. They necessarily lead to the conclusion that, if depressions of the skull do not in themselves indicate trephining, neither do they so even when, under the influence of reaction, unconsciousness and paralytic symptoms make their appearance. They only indicate those remedies which keep down the reaction, and trephining certainly cannot in the least be said to do this.

Dr. Stromeyer has, on principle, not trephined in two campaigns, and we have seen the results. After the exposition of his reasons, nobody, he hopes, will regard his disuse of trephine merely as an experiment, but will accept it as the necessary result of observation and of correction of preconceived opinions. The strongest corroboration of the author's views regarding the treatment of compound gunshot fractures of the skull is, perhaps, the statement of Mr. Rose, of the Coldstream Guards, recorded by Sir George Ballingall:—

"On the 3d of August, 1809, six days after

the battle of Talavera, an order was given for all the wounded in hospital at the latter town, who could march, to leave it. Among those who undertook the march there were twelve or fourteen with wounds in the head, accompanied with injuries of the bone. At least four or five of these had both tables of the skull fractured, and two of them, along with fracture of the os frontis, had each the globe of one eye totally destroyed. In none of them had the trephine been applied, nor had any attempt been made to remove splinters of bone. After leaving Talavera they were exposed to very severe fatigue. Every evening, after the day's march, Mr. Rose collected the wounded around him, and examined and washed their wounds, dressing with care those that particularly required it. Cold water was the principal application employed. The retreat occupied sixteen days, in spite of which, and with no other treatment than that which has been described, every one of those which were wounded in the head recovered."

GUN-SHOT WOUNDS OF THE EYE.

According to Cooper* "gun-shot wounds of the eye, whilst presenting many points in common with injuries from other foreign bodies, possess characteristics entitling them to separate consideration. A shot striking the eye may cause simple bruising and concussion, or it may glance off, cutting a groove without penetrating; it may pierce through the tunics (showing no mark as we have stated before) and lodge in the globe; or lastly, it may traverse the eye and bury itself in the orbit. The effect of a spent shot is generally to produce concussion of the retina and subconjunctival ecchymosis."

When the surgeon is summoned, the first thing to be done is to ascertain, if possible, the relative position of the injured and injuring parties when the accident occurred; carefully cleanse the eye, and make as full an examination as possible. The following points are to be considered (from the authority before quoted) in determining the question as to whether or not a shot has pierced the eye; "the weight of the shot, the distance from which it was discharged, the position of the eye, and the direction whence the shot came. A heavy pellet will plunge into the eye at a hundred yards, when a light shot would glance, or fail to enter at fifty. The more obtuse the angle of incidence, the less the chances of the shot penetrating. The elasticity of the tunics is such, that a round pellet, di-

rect from a gun, may be thrown off, when an angular or jagged shot, rebounding from a stone, will tear through them, and the laceration within the eye will depend on the size, shape, and force of the shot."

A guarded prognosis must in all cases be given by the surgeon, as often a slight grazing or spent shot, may by its concussion, detach the retina, and cause hopeless amaurosis, and when a shot has penetrated the eye, the risk is always grave. Occasionally the shot will simply pierce the cornea, and dropping into the anterior chamber, can be extracted without difficulty, but such cases are rare. The ordinary treatment is removal of the shot if possible; leeches freely applied and cold lotions. Internal treatment—calomel, with opium, or morphine, while soft extract of belladonna is applied around the eye if the iris is at all inflamed; rest in a darkened room, and liquid diet.

Military surgery presents cases of wounds of the eye peculiar to itself; the globe may be torn out of the socket, or it may be lacerated and bruised into a pulpy mass; one or both of the optic nerves may be cut across by the passage of a ball. Wounds of the eye and its appendages demand some serious consideration from the military surgeon, not only owing to its great importance, as an optical instrument of the most perfect construction, wounds of it are often the immediate cause of death. It is also true that in the great majority of cases seen by the military surgeon, there is little opportunity for the display of ophthalmic surgery in the preservation of vision, yet it seemed desirable and proper for us to follow so high an authority as the great Larry as to point out the nature and results of the principle lesions which have been met with.

During the war in India by the English, a private of the 18th Regiment was struck in the right eye by a ball, which was cut out between the spine and the posterior edge of the right scapula; he died in the hospital at Umballa some weeks after his arrival there. It was ascertained that the ball had entered the lower part of the right eye, passing through the floor of the orbit, then plunged along the base of the skull, carrying away the styloid process until abreast of the foramen magnum, when it quitted the bone and passed down the neck into the back.*

M. Menière, in his account of the Hotel Dieu, at Paris, during "the three days," tells us of a

* On Wounds and Injuries of the Eye, by Wm. White Cooper, London, 1859.

* Edinburgh Medical Journal, No. xi.

ball which entered at the inner angle of the left eye, passed downwards and backwards, and to the right side, under the base of the cranium, and was cut out from above the right shoulder. The patient recovered rapidly without a bad symptom. Sometimes the course of the ball cannot be ascertained. A French soldier was wounded at Waterloo. The ball entered the right eye; the left, though not in the slightest degree injured in appearance, was completely blind. The patient was quite convinced that the ball had entered his brain, but its seat never could be discovered by Dr. Henne. He returned to France convalescent.

Occasionally the eye is torn from the socket, the surrounding parts being little injured.

Dr. F. Isenschied has recorded* a case of a soldier who was struck by a ball on the right eye, which was driven almost entirely out of the orbit, the cornea and sclerótica being ruptured, and the vitreous humour lost; nevertheless, neither the lids nor the orbit were implicated in the wound.

A good example of the terrible effects resulting from a gun-shot wound is related by Dr. Fenin, the Chief Surgeon of the Military Hospital at Cambrai:†

A soldier in Algeria was shot in the face; the bullet passing from left to right, destroyed the cornea and the upper portion of the sclerotic of the left eye, the bones of the nose, and lodged in the external and posterior angle of the right orbit. On the following day he was admitted into the Hospital at Blidah.

The right eye thrust outwards was enormously swollen, cold to the touch, and dull in color; the eyelids, equally swollen, were of a violet hue; there was violent pain in the head, and febrile disturbance.

Dr. Fenin found a tendency to gangrene, and decided on immediate extirpation of the eye, which he executed with facility. On passing the finger into the orbit, the ball was discovered flattened and misshapen, considerable difficulty was experienced in extracting it. The patient made a good recovery, though of course totally blind.

"The battle of Waterloo gave rise to numerous examples of lamentable injuries to the eyes produced by musket balls. In cases where the balls had passed near the eye, the vision was destroyed, in some without any apparent injury of the eyeball, and in others with the

occurrence of every degree of inflammation. In a case where the ball passed behind the eyes, from temple to temple; one eye was destroyed by inflammation, and the other affected with amaurosis, but without inflammation. In a third, where the bullet entered the face on the upper and left side of the nose, and passed out anterior to the right ear, the patient was afflicted with amaurosis of the right eye. The left eye was similarly affected in a case where the ball had entered the right side of the nose, and had come out before the left ear. From eight to ten instances were seen in which musket balls passed through behind the eye from temple to temple. In one soldier the ball had passed through and behind the eyes, and he was affected at the end of some weeks with painful spasms in the face."*

A case is mentioned by Dr. Macleod,† showing how little injury and inconvenience may be caused by the immediate vicinity of a bullet to the eye. A soldier was struck at the battle of the Alma by a round ball, which entered close to and immediately below the inner canthus of the eye. The wound healed, and the patient had almost forgotten the circumstance, when after suffering slightly from dryness in one nostril some months afterwards, the musket ball fell from his nose, to his great alarm and astonishment. During the retreat towards Corunna, a soldier of the 36th regiment, who was left to cook his comrades' dinner whilst they were skirmishing with the enemy, was seen to suddenly fall backwards, and Dr. Burton, who chanced at the moment to be near, ran to him, and found that he had received a wound under the left eye, as if made with a rough cutting instrument; very considerable ecchymosis took place, which was got rid of by pressure. Dr. Burton extracted from the socket a musket ball, flattened so much as to resemble a piece of money, from its having first struck against the wall in front of the man. The eye did not suffer in the least, although the soldier underwent a very distressing march that night.

At the siege of Badajoz, a soldier of the 52d was struck by a bullet, which passed in at the inner canthus of the eye, fracturing the bone; blindness was the instant consequence, though the globe of the eye was not destroyed.

In Dr. McCrae's "Medical Report of the Campaign in the Punjaub, 1848-49," "it is stated that a European was struck by a musket

* Ann d'Oculistique, t. xxx, p. 107.

† Ann d'Oculistique, t. xx, p. 105.

* Cooper, p. 86.

† Surgery of the Crimean War, p. 223.

ball, which entered at the side of the nose, passed into the orbit, and lodged just behind the eye; vision was lost, but the eye was unaltered in appearance. The man never felt inconvenience from the ball.

The injuries to the eye during the Crimean war were less numerous than might have been expected, the following interesting cases and observations were reported.* In one case a comrade's double tooth was found imbedded in a soldier's eye; in another, a portion of a man's skull was removed from between the eyelids; but generally it was from sand or small gravel stones struck up by shot or propelled by shell explosions, that injuries to this organ occurred. The removal of foreign bodies in this situation is imperatively called for not only to prevent or moderate inflammatory action in the injured organ, but in cases where only one eye is wounded, to prevent the extension of inflammation to the opposite eye by sympathy, and thus prevent the loss of a soldier to the service. It will be seen by the return, that twenty-four out of forty-one cases of injury to one eye, returned to duty without leaving the Crimea, only fifteen of this series having been sent away for further treatment, and the majority of these subsequently returned to duty at home, or from Scutari.

"In most of the instances before us, the vision of the injured eye was entirely lost, and complete collapse of the eyeball happened. In a few instances, however, small particles of stone were removed from the cornea without having penetrated into the interior of the organ. In one such case which occurred in the 77th regiment, the injury was followed by traumatic cataract of the wounded eye; but these fragments of stone sometimes penetrated into the interior of the eye; where visible, the proper practice would undoubtedly appear to be to remove them by incision, but no case is recorded where such was effected and vision retained.

In one instance, a man of the 88th regiment was wounded by a musket ball, which entered at the inner angle of the left eye, and made its exit close to the lobule of the right ear, passing behind the nasal bones. Neither eye appeared to have been organically injured, yet the vision of both was irreparably destroyed. On examination, the pupils of both were found to be much dilated, and they did not act to the stimulus of light. No appreciable inflammation

of the eyeballs followed, nor could any other change in the shape or appearance of the several structures composing them be detected, but the eyes became at once and remained completely amaurotic, the man asserting that he was even unable to distinguish between bright light and total darkness. The wound gave little trouble, and he was invalided to England well, but totally blind, about a month after its receipt, and discharged from the service in this condition. In this case we are driven to the supposition that the concussion produced by the ball had injured the optic nerves." This case should have been submitted to a careful examination on his return to England by the ophthalmoscope, and no doubt would then have remained, as to the result of the injury. Might it not have been a detachment of the retina?

The following cases are reported as having occurred in the Naval Brigade: George Ellis, aged 22, of the "Queen," had been struck apparently by a piece of stone broken from a parapet of the battery, below the left eye; the anterior wall of the superior maxillary bone was fractured, and the antrum opened.

Another piece appears to have struck the cornea and laid it open, giving exit to the contents of the eyeball. His face and eyelids were covered with small wounds caused by gravel striking forcibly against them. A probe could be passed deep into the wound under the eye, but it did not detect any foreign body. The wounds were cleaned and dressed with lint. This man recovered with the loss of the left eye. On the 24th of August, a seaman was struck by a musket ball below the left eye; there was an elongated wound on the lower eyelid, and the eye itself was hidden by the swelling; the ball had lodged, but its position was uncertain. On the 28th, a hard, imperfectly circumscribed spot was discovered anterior to the ear, and opened; when the supposed foreign body was discovered to be part of the malar bone, which was loose in front, but connected posteriorly. The patient was sent to Cossack Bay, where the ball was extracted from the antrum, but the sight of the eye was lost.

"No case is recorded of a musket ball or other foreign body, lodged behind the eyeball, but enormous swelling, with inflammation of the eye and lids, sometimes followed the lesions already mentioned, requiring active treatment by incision, bleeding, and free leeching for its control; but in no instance was the entire re-

* Medical and Surgical History of the British Army which served in Turkey and the Crimea, during the war against Russia in the years 1854, '55, '56.

removal of the eyeball called for. One case occurred where both eyes were irrevocably destroyed by the gravel thrown up by a shell-explosion, complicated with extensive bruising and laceration of the face; one testis had been cut away entirely, and more than half of the other, with a large portion of the integument of the scrotum, by a fragment of shell, and a severe laceration of the forepart of both thighs existed. Both eyes had been penetrated and were collapsed; no bleeding of any consequence took place from the divided end of the cord; the parts were simply cleansed and lightly dressed, and notwithstanding the severe nature of the general injuries, he was invalided to England at the expiration of two months, well but quite blind.

"Not less than four cases of loss of both eyes took place from explosions of magazines; these are returned among miscellaneous wounds and injuries, but two of them were cases identical with those last mentioned, where the coats of the organ had been perforated by fragments of foreign bodies driven against them, and vision entirely lost, the eyeball collapsing; but in one instance, the eyes seemed to have been disorganized by the direct force of the concussion conveyed by the medium of the air. In this case the aqueous humor would appear to have been forced between the layers of the cornea, as though no rupture of the eye existed, and the eyeball was full and retained its natural rotundity, a complete blueish white opacity of the whole of this membrane was found to have taken place within a few hours of the receipt of the injury. In this case the amount of inflammatory action set up was very slight, but vision was completely and permanently destroyed.

"In wounds of the eyelids and other appendages of the eye, considerable care and nicety of adjustment were occasionally called for, as every practical surgeon may well understand, and in wounds of the eyelids the use of sutures was more urgently called for to prevent subsequent deformity than in almost any other part of the body."

	Total treated.	Died.	Discharged to duty.	Invalided.
Penetrating wounds with lesion of				
One eye.....	42	3	24	15
Both eyes.....	2	2

One of the deaths was caused by tetanus, and two by inflammation of the membranes of the

brain supervening, where one eye had been destroyed. As cases of tetanus, from injury of the eye are rare, we will give the details of the case.

CASE OF TETANUS.

Private William Harding, 1st Battalion, Rifle Brigade, was admitted into the Regimental Hospital, on the 5th of September, with a severe contusion of the face, and very considerable swelling on the left side of the head.

The injury had been inflicted by the explosion of a shell, which drove a quantity of stones and gravel into his face; much of this was removed. The eyelid of the left eye was found to have been divided, and the eye destroyed. He complained of very great pain in the face and eye, but there were no remarkable constitutional symptoms. On the 7th of September, in syringing out the orbit, a hard substance was felt, and with some difficulty a piece of stone, the size of a large walnut, but of angular shape, was extracted, and much gravel, in small fragments, was afterwards washed out of the orbit. This relieved him much, and he was very easy till the ninth, when he complained of twitching about the mouth, and, on putting out his tongue, it was violently and involuntarily bitten by spasmodic contraction of the temporal and masseter muscles. The sterno-cleido-mastoid muscle was also much affected with spasms. These were increased or brought on by any attempt to protrude the tongue or to swallow.

Treatment.—The spine was blistered and sprinkled with morphia, calomel frequently given in small doses, and chloroform exhibited; but the tetanic symptoms continued and became worse, and he died in great pain on the 11th, having remained perfectly sensible the whole time. On examination after death, it was found that the bony orbit was extensively fractured, including the orbital plates of the frontal, superior maxillary, and æthmoid bones. The sclerotic coat of the eye was torn open, and much gravel imbedded in its interior, and some fragments had been forced into the substance of the optic nerve.

Treatment.—"When a ball lodges behind the eye, it usually causes protrusion, inflammation, and suppuration of that organ. If it be not discovered by the usual means, its lodgment may be suspected from the gradual protrusion and inflammation of the eye itself. If it be

discovered, it should be removed, together with the eye, if such proceeding be necessary for its exposure. If suppuration has commenced in the eye, a deep incision into that organ will arrest, if not prevent, the horrible sufferings about to take place, and allow of the removal of the offending cause. If the eye remain in a state of chronic disease and suffering, a similar incision will give the desired relief. If the chronic state of irritation affect the other eye, the incision and sinking of the ball of the one first affected or injured is urgently demanded and should not be delayed. I have several times seen both eyes destroyed and sunk by one ball, with little other inconvenience to the patient; one eye sunk, the other amaurotic, and both even amaurotic, almost without a sign of injury, by balls which had passed from side to side through both orbits, but behind the eyes. When the eye becomes amaurotic from a lesion of the first branch of the fifth pair of nerves, the pupil does not become dilated; the iris retains its usual action, although the retina may be insensible and vision destroyed.

This was well shown in the case of the late Major-General Sir A. Leith, who was wounded by a sword in the forehead, this nerve being divided."

Larrey, in speaking of the solutions of continuity, to which the auxiliary parts of the eye may become subject, makes the following observations on those which destroy the integrity of the *eye-brows*. "When the latter have been occasioned by pointed or cutting instruments, they may be accompanied by lesion of some of the branches of the trochlearis nerve, which are furnished by the ophthalmic of Willis."

"This circumstance may give rise to pretty serious nervous symptoms; suspend the functions of vision for a longer or shorter time, or change them in proportion to the extent of the injury. When this is the case, the injured nerves should be clearly divided, and the wound itself be converted, as far as may be expedient, into a simple solution of continuity. The nervous symptom will then instantly cease, and vision, which may have been suspended or weakened, will be restored with equal dispatch."

The following example is given by him under the article *Tetanus*:

"Upon the occasion of a charge of cavalry, M. Markeski, a lieutenant of a regiment of light horse, received, while in Austria, a thrust with a lance on the right side of the forehead. The point of this weapon had entered obliquely from

below, upwards and inwards, under the pericranium, so as to produce a deep fissure in the substance of the frontal bone. One of the branches of the frontal nerve had been grazed (*eraillé*) by the cutting edge of the lance. In the night of the ninth until the tenth, tetanus was ushered in by convulsive motions in the eye-lids of the corresponding eye and by loss of sight in that organ. There was also some slight aberration of the mind. Emollients applied to the seat of the injury, and the exhibition of diaphoretic and opiated draughts, produced no effect whatever; the complaint went on increasing, and there was no doubt, that before the expiration of twenty-four hours, it would have arrived at the highest stage.

"I sounded the wound and readily discovered its whole course; the passage of the probe causing the patient the most acute pain.

"These motives determined me to divide, with a bistoury the entire substance of the corrugator supercillii muscle, and the injured nerve and blood vessel distributed to it, which was accomplished by a single incision from below upwards.

This officer experienced immediate relief, and in less than twenty-four hours all the tetanic symptoms were dispersed, and vision was completely restored."

He goes on to observe that "If however, some branch of the supra-orbital arteries has been divided, it will be best, after separating all the nervous filaments from them, immediately to apply a ligature, because mere pressure is often insufficient to stop the hemorrhage.

But, in no instance whatever, should the eye-brows be shaved, inasmuch as these hairy productions, with respect to their growth, remain stationary until old age, and that consequently months and years will be required ere nature can entirely reproduce the deficiency. If the division of the eye-brows is deep and extensive, it will be useful and almost indispensable to have recourse to a few stitches of the interrupted suture, so to preserve the precise consolidation of these parts, and the original relation of the hair which grows upon them.

The *eyelids* may be divided or lacerated, singly or both at once, in their whole diameter, and in different directions, either by side arms or by projectiles of greater or lesser size. In every such case, immediate reunion is the first indication, and if the solution of continuity be regular and uniform, it may be accomplished without any further preparatory measure.

Where, however, their edges should appear to have been abraded, unequal, or notched, they should previously be cut smooth with a pair of curv'd scissors, being converted thus into simple wounds, an interrupted suture will keep them in exact apposition, and restore the eyelids to their primitive or normal conformation. Any loss of substance which may have occurred in their thickness, especially when the wounds are of a recent date, should be at once unhesitatingly supplied by a reunion of parts, for the inconveniences which are liable to result from retraction of these loose shreds suffer no comparison with those which their chafing might possibly produce."

No apprehension need be entertained on account of the passage of the needle through the tarsal cartilages, which, like all other tissues of the same genus, are not susceptible of inflammation; but care should be taken, when the suture is employed, to embrace within it a larger portion of the parts exterior to the globe of the eye, than of their inside surface, so as to prevent the retroversion of the eyelid; but, above all, the eye-lashes and the margin of these membranous coverings should be fixed in their precise situation. Care also should be taken when the solution of continuity is in the vicinity of the puncta lachrymalia, that the lachrymal ducts which arise there are not included in the suture. This dressing should next be supported by immobility of the parts, by an appropriate bandage and rest. It will be proper to keep the internal surface of the injured eye-lids moist, with a few drops of the oil of sweet almonds, in order to prevent the formation of adhesions to the corresponding point of the ocular conjunctiva. We are possessed of several examples of various injuries of these parts which, by the measure above described, have been treated with unhop'd for success.*

Gun-shot Wounds and Injuries of the Ear.—

Wounds of the auricle, according to Wilde, were found to occur in the French soldiers after the battle of Constantina; these, he was informed, were inflicted by the Yataghan. In Germany, when sword duels were common among the students, simple incised wounds were numerous, and instances have been related of adhesion having taken place even after the parts had been completely removed. The same authority recommends the application of lint spread with white of egg, so as to keep the parts in strict

apposition; also a cork pad, accurately adjusted to the space between the posterior surface of the auricle and the mastoid region. Baron Larrey's work contains some valuable observations upon wounds of the auricle, and the mode of treating them; he states that "solutions of continuity of the external ear vary very much according to the extent, the shape, and the nature of the causes which produce them. Incised wounds or divisions made by sharp instruments may be limited to a portion of the ear, or they may include almost the whole of its extent; for when it has been cut off entirely and separated from the head, there is nothing to be done in order to restore it to its primitive relations. Every attempt to accomplish such an object will prove abortive, for its adhesion to the parts, from which it may have been completely detached, will never again take place. In every other case, and be the point never so little by which the divided flap adheres to the remainder of the ear, or to the margin of the meatus auditorius, immediate reunion is at once indicated, and should be made by means of the interrupted suture. The cartilages forming the external ear should be included within the stitches of the suture; no unpleasant symptom will result from it, and the suture will only be the more exact and firm. Care should be taken to fill up with charpie the intermediate spaces of the sinuosities of the ear and the channel by which it is separated from the temple.

"The dressing may be completed by a common retaining bandage, which, as far as may be expedient, should not be disturbed until the very moment of complete cicatrization. But, if these divisions are unequal or jagged, which necessarily happens when the instrument itself, which has caused the solution of continuity, presents inequalities in the acting surface, then the indication is, of course, different. In that case it is necessary to use a pair of curv'd scissors, and cut the edges of the division smooth, in order thus better to bring them in close apposition, and to produce a uniform cicatrix."

This class of wounds is frequently the result of bites from men or animals. It is, indeed, no rare occurrence to witness violent scuffles amongst individuals of the human species terminate by bites into the ears. Larry has seen this even among soldiers; but it is from motives of self-love that such persons carefully endeavor to hide this cause as well as every vestige of its effects; for, of all weapons which man may make use of for the purpose of avenging some insult, this, doubtless, is the most ignoble.

* Clinique Chirurgicale, Paris 1829-30.

All wounds and injuries of the meatus auditorius produced by sharp penetrating instruments, puncturing or lacerating the walls of the passage, should be treated by subduing inflammation and allowing the parts to recover with the least possible degree of irritation. If there is much hemorrhage, injections of ice water or solutions of styptics, as the persulphate of iron, etc. should be employed, and great care should be taken to discover the cause, especially if the patient is likely to die from it, as death may be produced by concussion or fracture through the base of the brain, or falls upon the side of the head. If from a polypus or fungoid granulations in the meatus, it is soon checked by an astringent wash of oak bark, tannic acid or alum, or one of the salts of iron. Larrey states that if such injuries are accompanied with loss of substance, the attention of the surgeon should be directed to the prevention of the agglutination of the parietes, and the obliteration of the meatus; an instance of such an accident occurred to a soldier, who, during the siege of Paris, had been wounded by a ball in the right ear.

Larrey makes some suggestions, not altogether useless to the military surgeon, on the accidental perforation of the membrana tympani and its results. The rupture of this membrane, although it may be complete and occasioned by a powerful rush of air, or by the shock of some mechanical cause, as the sharp report of a piece of artillery, is not invariably followed by incurable deafness. Larrey has seen several individuals in whom this perforation had actually occurred, and who, nevertheless, after having been deprived for a longer or shorter space of time of their auditory faculties, recovered them entirely and almost as perfectly as they were before the occurrence of the accident.

If, however, inflammation is set up and a discharge takes place, these openings are difficult to close, and this is especially the case if irritating applications have been resorted to in the early stage. The proper treatment for recent injuries is to let them alone; inflammation should be combated with local depletion; mild astringent washes can be employed after the acute symptoms have disappeared.

Larrey states that he could relate several cases corroborating the truth of his assertions, but he will restrict himself to the following fact:—M. Mazelle, one of the captains of the 18th demi-brigade, being the first at the head of a com-

pany of grenadiers who scaled the tower of Saint Jean d'Acre, in Syria, where a breach had been made to force a passage into that place, had been thrown down in consequence of the explosion of some Greek fire and other combustible materials, and was pitched into the moat of the tower. Besides other serious injuries which he sustained from so tremendous a fall from a height of upwards of thirty feet, he had both tympana broken, and was in an instant totally deprived of hearing. In this condition he remained for about ten or twelve years; nevertheless, after that period the function of hearing gradually became restored, and he finally recovered that faculty to such a degree that he could resume and perform all the military duties of his particular grade with the same precision as before the accident.

Gunshot and Penetrating Wounds of the Thorax and Pleural Cavity.—Believing that much injury and even death have followed the usual method of treating wounds of the chest, and approving the practice and precepts of a distinguished American Surgeon* in a recent contribution to this journal with cases, I feel I cannot do better for the young military surgeon than to quote his words.

"There cannot be any doubt that the time-honored rule of practice in penetrating wounds of the thorax, viz., the *timely and careful closure of the wound* after the bleeding vessels have been secured, for fear that collapse of the lungs would follow the entrance of air into the pleural sac, is *totally wrong*, and ought to be discarded. It is *not* true that atmospheric air—a medium which is constantly surrounding us and without which our existence would cease—when entering the pleural cavity will *necessarily* produce collapse of the lungs and phlogosis, with its results. Why should its contact with the pleura be more injurious after accidents than with the other serous tunics lining the great cavities and their organs? We puncture the abdominal cavity with impunity; enlarge abdominal openings with protrusion of the intestines, without apprehension of danger; we puncture even the pleura in hydrothorax and empyema, and do not fear a bad result; and yet we are taught to believe that air, entering the chest from wounds inflicted in a healthy state of the system by accidents, and not made for surgical purposes, is extremely hazardous."

Denying the deleterious effects of the contact of air with the pleura, it is yet very doubtful if air, in such a quantity as to cause compression of the lung, can enter an incised wound, con-

* A. G. Walter, M.D., Pittsburg, Pennsylvania. Med. and Surg. Reporter, June, 1861, p. 216.

sidering that the several tissues—skin, cellular tissue, aponeurosis, muscles, and pleura—when traversed by the instrument, are of different degrees of elasticity and density, that the fibers of the two sets of intercostal muscles run in opposite directions, and that the internal and external openings are seldom found exactly opposite to each other. Moreover, after the infliction of penetrating wounds, the patient generally becomes feeble and faint, the respiratory efforts, checked too, by pain, grow consequently weaker, the thorax expanding less and the intercostal spaces collapsing. Under these circumstances atmospheric air cannot enter by a small and oblique opening; but if large and capable of admitting a free current of air, with consequent oppression to the lung, the instinctive efforts of nature to relieve the lung of the compressing agent would be called into action by deep inspirations, and the air thus entering would be expelled again through the wound.

Therefore it is *not the entrance of air* in penetrating wounds of the thorax which constitutes the danger, but hemorrhage, with its effects and consequent inflammation of the thoracic viscera with its results. Though bleeding from a wounded *arteria intercostalis* may have, either spontaneously or by pressure and ligature, been arrested, yet it cannot be safe to close the wound immediately after, as already effused blood in the pleural cavity has to be removed.

Admitting that small quantities, when extravasated, will be absorbed, it cannot be denied that a large quantity, when filling the sac, and forcing the lung upon itself, will remain unabsorbed, and thus act as a foreign body, inducing empyema, with grave constitutional irritation. The correctness of the above conclusions being fully borne out by the result of cases, we are constrained to adopt, as the *only proper and safe practice* in the management of wounds of the thorax suspected to be penetrating, the following rules:—

“The *first* duty of the surgeon must be to ascertain, by gentle probing, if the wound be penetrating or not. This surely cannot augment the injury, being, moreover, demanded for the purpose of detecting in the track of the wound the presence of a foreign body—a broken knife, sword, bayonet, or bullet, etc. Thus the depth of the wound, and its direction being ascertained, the surgeon is put on his guard to expect internal bleeding. If this be present, the wound should be *left open*, the bleeding arrested by local and general means, and the outward flow of blood en-

couraged by inclining the body toward the wounded side. The propriety of even enlarging the wound, if it be small, and inward bleeding excessive, cannot be questioned. But if the effusion be moderate, and the wound small, it may be left to itself; if large, however, and the effusion great, part of the aperture should be left open, the rest closed by suture or plaster. The hazardous effects of secondary hemorrhage will thus be prevented by a free opening for the exit of the effused blood. Supporting the chest next by a bandage, in which an opening has been left opposite the wound, and by general and local antiphlogistic means, the patient will then escape the danger which otherwise must follow an injury of such a grave nature.”

Wounds of the Heart.—Slight wounds of the heart are curable when inflammation has not been great, as distinct scars have been observed on the pericardium, and on the surface of this organ. Cases have also occurred in which wounds of the heart have healed, in which, some time after the injury, death has taken place, and the bullet has been found in the heart.

We can only determine that the heart is wounded from the direction and depth of the wound.

The symptoms are: a more or less severe pain in the region of the heart; extraordinary restlessness; and insupportable anguish; irregular, intermitting pulse; cold extremities; cold sweat; and frequent faintings.

The following are examples of this severe injury: In a case reported by Featherstone,* of a soldier who slipped, and, falling upon his bayonet, wounded the muscular substance of the left ventricle; lived only forty-nine hours; two quarts of blood were effused into the cavity of the chest; the *pericardium* was nearly filled with blood, and had a puncture, which extended three-quarters of an inch into the muscular substance of the left ventricle, about two inches from its apex. On opening the ventricle, the bayonet was found to have penetrated its cavity, and to have cut through one of the fleshy columns of the mitral valve. A small coagulum was formed at the edge of the wound through the *pericardium*. A second case was reported by Dr. Babbington,† of a marine, who fell from the gangway on his bayonet, which pierced through the heart, besides wounding other *viscera*; he died in less than twenty-four hours. The emphysema, which had commenced early at the upper part of the chest,

* Med.-Chir. Trans., vol. ii.

† Medical Records and Researches.

gradually augmented, and, about three hours before death, had reached the head and face, and, before he died, had extended over the whole body.

The external wound was midway between the spine and linea alba, and the last rib and crest of the ilium; thence the bayonet had passed through the sigmoid flexure of the colon, through the stomach, two inches from the pylorus; thence through the left lobe of the liver, through the center of the tendon of the diaphragm, and the pericardium; then through the heart near the tricuspid valve, through the lungs, and out of the right side of the chest, between the cartilages of the second and third ribs, terminating in the substance of the pectoral muscle. In the belly there was a little bloody serum; in the *pericardium* a small quantity of blood, but in the right pleura two quarts of the latter fluid.

A third case is reported by Fournier,* of a soldier, who received a gunshot wound of the chest, and was taken up for dead, on account of the severe bleeding which had occurred. By great care the flow of blood began to diminish on the third day; his strength insensibly increased, suppuration came on, and many splinters of bone exfoliated. After three months, the wound was healed; the patient's health restored, without other inconvenience than frequent palpitations of the heart, which harassed him for three years. During the following three years they became less troublesome, and he then died of disease unconnected with the heart. On examination, the cicatrix was found very deep, with loss of substance of the fractured rib. The ball was found lodged in the right ventricle of the heart, near its tip, enfolded, in a great measure, in the *pericardium*, and resting on the *septum medium*.

Gunshot Wounds of the Abdomen.—"In a penetrating wound of the abdomen," says Hennen, "whether by gunshot or by cutting instrument, if no protrusion of intestines takes place, and this, it must be observed, in musket or pistol wounds rarely occurs, the lancet, with its powerful concomitants, *veratrum viride*, abstinence, and rest, particularly in the supine posture, are our chief dependence. Great pain and tension, which usually accompany the wounds, must be relieved by leeches to the abdomen, if they can be procured, by the topical application of fomentations, and the warm bath; and if any internal medicine is given, as a purgative, it must, for obvious reasons, be of the mildest na-

ture. The removal of the ingesta, as a source of irritation, is best effected by frequently repeated oleaginous enemata; indeed, on the first infliction of a wound of the abdomen, the contents of the intestinal canal and stomach are generally evacuated spontaneously by vomiting, and soon followed by stools, which are sometimes tinged with blood; their accumulation must be guarded against by a rigorous diet; for, to the general state of fullness of the vessels induced by food, is added its local and mechanical stimulus, in the undigested form."

Further treatment will be to close the wound with silver wire or pins, apply compresses soaked in tepid water, and a flannel bandage; or occlude the wound from the air by collodion. Look carefully to the position, cause him to lay upon his back, with his limbs drawn up. If pus forms, do not wait for nature to point, open as soon as fluctuation is discovered. Warn the patient *against hernia*, and, if necessary, apply a proper truss.

Penetration of Wounds of the Stomach, by Stab from Knife, Sword, or Bayonet.—The usual symptoms are vomiting of food, then blood, with fixed pain in the region of the stomach, with anxiety, depression, and all the other symptoms accompanying penetrating wounds of the abdomen. If the external wound be large, a part of the stomach may protrude through it.

Prognosis.—Always very dangerous, from extravasation into the abdomen, and inflammation. Wounds in the middle are considered less dangerous than those in its curvatures.

Treatment.—Do not enlarge or probe the wound. There is little danger of substances escaping; plasma is effused, which glues the edges together. Hernia of the mucous coat takes place, and fills the orifice. Let nature alone, give no food, medicine, or drink; if thirsty, permit the use of a little ice, as it is absorbed as fast as melted. Nourish him by injections of broth, etc., by the rectum. If severe spasmodic symptoms be present, give opium in enemata. Apply lint, dipped in cold water, on the wound; if the wounded part of the stomach protrude, a silk thread may be drawn through both edges, and the ends be allowed to hang out. In a case treated by Travers, he tied a ligature around the wound of the protruded stomach, and the patient recovered. If inflammation should arise, treat it actively. If the stomach is simply strangulated in the wound, dilate the latter, rather than handle the stomach. Inclose the edges of the stomach,

* *Cas Rares*, Dict. des Sciences Medicales, pp. 396-7.

if wounded, and the integument in the suture. After forty-eight hours, the loop may be withdrawn, because adhesion to the peritoneum has taken place.

If a fistula remain, the opening must be kept closed by compressing apparatus.

Penetrating Wounds of the Intestines.—The intestines may be wounded by sword, bayonet, or gunshot.

In slight stabs, the opening of the wound is always closed by the protrusion of the inner coat; if longitudinal, the edges of the wound always turn out, and, from the contraction of the longitudinal and transverse fibers of the gut, the wound assumes an oblong form. The symptoms of wounds of the intestinal canal are vomiting incessantly, sometimes of blood, and even of feculent matter; fetid air and feculent matter escape from the wound; if the wounded gut protrude through the opening, it is found collapsed, and the wound in it may be seen. If the wounded intestines be in the abdomen, these symptoms often appear, and the injury of the intestine can only be presumed, from the depth to which the instrument has penetrated. If the wound of the intestine is small, pucker up the opening with a pair of forceps, then tie a ligature around the base, cut off the end, and return into the abdomen; plasma is effused, and the ligature cuts its way, and escapes into the cavity of the intestines. Treat small sloughs in the same manner. If the opening be oblique or transverse, and half an inch long, use the glover's suture, bringing the serous coats in contact, that adhesion may take place; introduce the suture a little distance from the edge, and let an assistant depress then, when the suture is tied; then cut off both ends, and return into the abdomen. The ligature escapes in the same manner as before. In the wound in the abdomen, if from a sword, and long, take care to unite it by pins, passing these carefully through the peritoneum, with a small gum-elastic ring, cut off from a tube, passed over the protruding ends.

"Larrey carefully unites wounds with the glover's stitch, folds them in opposite directions, and brings them together with two threads of different colors."

"Hennen says that he has had only two cases of wounds of the intestine, one with a shoemaker's knife, and the other with a sabre, and he practised the mode by a single stitch in the abdominal parietes, and then closed the wound: * * * cutting off both ends of the ligature, and a per-

fect cure was effected in a few days in both cases."

The following remarkable instance of a ball, which penetrated the abdomen and intestines, and, after a time, passed by the natural passage, is from Hennen:—

Case.—Sergeant P. M. received a ball in the belly on the evening of the 18th of June, 1815, which struck him "upon the right side, about an inch below the navel, and three fingers' breadth to one side. Scarcely a tinge of blood followed the wound.

"He did not fall, but walked about fifty yards to the rear, from whence, in half an hour, he was carried to a large barn in the village, where he remained for three days before he was conveyed to a hospital at Brussels. During this period he was bled three times, *ad deliquium*. The first vein was opened about twenty-four hours after the receipt of the wound. On his arrival at Brussels, his principal complaint was incessant straining to stool, for which he received daily clysters. On the sixth day from the receipt of the wound, immediately after an enema, he had an urgent call to the close-stool, when he passed a small-sized musket-ball, enveloped in mucus, and unaltered in shape, except a small groove indented in it, probably from cutting along the bayonet or ramrod of the piece from which it was fired.

"The wound was perfectly healed on the 26th of August following, without any ill accident or uncommon occurrence from the time of receiving it, except that, during the course of the first night, he was sensible of a sort of watery oozing that moistened the linen placed on his wound, particularly whenever he drank, which he frequently did. This circumstance he was never afterward sensible of. He joined his corps at Paris, but had not been more than ten weeks there, when severe pain again arose in the bowels; some bits of cloth were passed by stools, an abscess formed externally; and every symptom threatened approaching *peritonitis*, which was relieved by active means, under the charge of Staff-Surgeon Dease. In the following year he was seen: his general health was good, but if he indulged in a full meal, he felt severe pain in the part."

Gunshot Wounds of the Liver.—Severe injury of the liver, from gunshot and penetrating wounds, is to be suspected from their depth and direction. A large amount of blood of a deep, black color flows, frequently mixed with bile; there is pain of a deep-seated character in the right hypochondrium, which extends to the right shoulder.

The prognosis depends upon the severity of the wound; if deep seated, and tearing the large vessels of the liver, extravasation of blood and bile

occurs into the cavity of the abdomen, which usually terminates fatally. If the wound is only superficial, by causing adhesion between it and the peritoneum the patient may be saved.

Treatment should be strictly antiphlogistic, placing the patient on his right side, so that all discharges will flow out. To check the bleeding, employ ice and leeches to the rectum. If the wound suppurates, apply poultices, with a supporting bandage to the abdomen.

Wounds of the Gall-Bladder.—These are considered possible without injury to the liver; they are characterized by extravasation of bile into the cavity of the abdomen, and are considered fatal. Gooch quotes from the *Philosophical Transactions* the case of an officer, who received a wound in the inferior part of the gall-bladder without the adjacent parts suffering any considerable injury.

The *abdomen* was immediately distended, as if the patient had been afflicted with *ascites* or *tympanitis*, which continued till his death, about a week after receiving the wound. His bowels remained obstinately constipated, purges and clysters having no effect; and though considerable doses of opiates were given, they procured little or no ease. The external appearance of the wound was pale, crude, and flaccid. On the fifth day complained of nausea, and had slight hiccup; his pulse was strong, equal, and slow, till the day before he died, and then intermitted a little. His senses were perfect till death.

Wounds of the Spleen.—Wounds of the spleen are almost always fatal, owing to the large amount of blood lost, and its acting as a foreign body in the abdomen; yet there are instances on record, where patients have recovered from very severe wounds, in which the spleen has protruded through a wound in the abdomen, and has been partially removed, and yet the patient did well. The well-known instance of the soldier who was found, after the battle of Dettingen, with his spleen protruding and covered with dirt, is a case in point. The surgeon not liking to return it, cut it off; and yet the patient recovered.

Also the interesting case, reported* by W. B. Powell, M.D., of Kentucky, of a man, aged thirty years, who was stabbed, at night, in the left side, about four inches anterior to the spine, by a knife

or large dirk; two inches of the spleen protruded, and being prevented from reduction on account of a slit in the protruded extremity one inch in length, which induced him to believe that such an act would endanger the patient's life from internal hemorrhage, though but little blood followed in consequence of the stricture of the lips of the wound. On the following morning the spleen was in a state of high inflammation; he, in consultation with Dr. Bennett, of Newport, Ky., amputated the protruding part, first applying a ligature from a slip of a tendon. He then attempted to make a perfect reduction of the spleen; but found it impracticable, without the use of injurious force, to get the amputated extremity of the spleen below the diaphragm, because of the great contraction of the muscle; it was therefore left to nature, by closing the external wound. He took a pound and a half of blood from his arm; put him in bed, prescribing light diet, and an absence from company. On the third day his pulse, skin, etc. indicated an unusual degree of constitutional excitement, which was subdued by antimonii et potassæ tart., with sodæ carbonatis, in small doses, and bread and milk poultices to the wound. On the fourth day, healthy pus was discharged from the wound for three days; and then it was discharged internally, followed by symptoms of peritoneal inflammation, which yielded to the administration of the above-named medicines, with warm fomentations and evaporating lotions to the abdomen. After this, he continued to improve; and on the fourteenth day was discharged, though the wound was not entirely cicatrized. Dr. Powell saw him nine months after, when he informed him that the wound was perfectly healed, and that he enjoyed excellent health.

Gunshot and Penetrating Wounds of the Bladder.—In naval and military operations the bladder is wounded, more especially when full and raised out of the pelvis. These wounds are more or less dangerous, depending upon the wounding of the *peritoneum* or the *infiltration of urine* into the cellular tissue.

The treatment is to leave the wound open, introducing a large catheter into it that the urine may be carried off. Place your patient on a strictly antiphlogistic treatment, with as little fluid as possible, and let the wound heal by granulations, or if very extensive, close a part by sutures, with light dressings.

* Amer. Jour. Med. Sci., vol. i. p. 481, 1827.

According to "South,"* in the museum at St. Thomas's Hospital is the ball which was received by Colonel A., while in action before Alexandria; it was a grape-shot, which, passing through the right ischiatic notch, taking a circuitous route through the pelvis without wounding any large vessel or nerve, and came out under Poupart's ligament on the left side, and was found in his pantaloons. In its passage, the ball had wounded both the *rectum* and *bladder*; and he was removed on board of ship under the care of Mr. Este, who found him sinking very fast. He, however, constantly applied poultices, as hot as could be borne, and gave him bark, camphor, ammonia, etc., with brandy and bottled porter, by which latter he was much refreshed. The physician-general was called in consultation, who stated that recovery was impossible—the wound being gangrenous, discharged extremely, and was intolerably offensive. The feces and urine passed through the lower wound, but there was no natural evacuation by the *rectum* or *urethra*. After some few days a favorable change in the wounds commenced: the sloughs separated, healthy pus was discharged, granulations were produced, and the wounds healed. The feces at length, and also the urine, passed by their natural channels. When able to use crutches, he was sent in a convalescent state to Malta.

Stricture of the rectum ensued, of which he was cured by Sir A. Cooper, and some of the gold-lace of his uniform came away.

Case 2.—M. M., aged forty years, a healthy sailor, was admitted into St. Thomas's Hospital under the care of the celebrated surgeon Cline the elder.

Feb. 20, 1812. "It appears that in July, 1811, during an attempt to cut out a schooner, he received a shot in the right hip; the ball entered the *dorsum ilii*, obliquely downward, within about two and a half inches of the sacrum, and an inch above the ischiatic notch, while he was sitting pulling an oar, which he continued to do for some time after. The wound bled profusely, and

in a few minutes after he had great inclination to make water, which was done with great difficulty and pain, only coming away by drops. On the following day he was carried to a hospital at Cadiz, where for three or four days he continued to discharge his urine only in drops, and accompanied with burning pain, when retention of urine took place which remained for four days, occasionally being relieved by the catheter; at the end of which time the cause was explained, by a piece of shirting and of his trowsers having made their way up to the orifice of the urethra, closely rolled up to about the size of a goose-quill and two inches in length.

"Upon extracting this, by means of a pair of dressing forceps, the retention of urine was completely removed. During the time of retention, and then only, did urine mixed with bloody discharge pass out at the wound of the ilium. For several days after the extraction of the wadding, there was a discharge from the urethra of thick,ropy mucus mixed with blood.

"The urine passed freely, but with heat and pain referred to the end of the penis, and a frequent desire to void urine. These symptoms continued, except that latterly there was difficulty in passing his water. The wound had healed about a month previous to his admission into St. Thomas's, having a stiffness and pain in the motions of the limb. The bullet was found encysted on the left side of the bladder, much flattened, and having a small portion of bone adhering to it. He recovered very quickly after the operation."

In concluding this series of papers on military surgery, let me hope that my efforts to contribute to the knowledge of the volunteer surgeon engaged in the cause of his country, may not have been entirely fruitless. Having commenced their publication prior to the appearance of any of the now numerous and valuable works on the subject, I felt that a void existed, which might better have been filled by others. Many points have been omitted, being regarded merely as of theoretical value; yet the author has received gratifying evidence that his labors have been appreciated by those engaged in the field and hospitals, endeavoring to relieve the sufferings of the brave men who are fighting in the defense of their glorious country.

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